QUESTION BANK

MCA

SEMESTER I

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FUNDAMENTALS OF INFORMATION TECHNOLOGY

MCA 101

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UNIT – I

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   Adding inverters to all inputs and outputs of an AND gate produces the OR logic function.
2   The EX-OR gate is sometimes referred to as the 'any but not all gate".
3   Excess codes are known as unit-distance codes.
4   Gray codes are weighted codes.
5   NAND and NOR gates are known as universal gates.
6   A truth table illustrates how the input level of a gate responds to all the possible output level combinations.
7   A NOR gate output is LOW if any of its inputs is LOW.
8   As a rule, CMOS has the lowest power consumption of all IC families.
9   Good troubleshooting is done by looking at the input signal and how it interacts with the circuits.
10   A NOR gate and an OR gate operate in exactly the same way.
11   In an AND gate output is LOW if all the inputs are HIGH.
12   An OR array is programmed by blowing fuses to eliminate selected variables from the output functions.
13   An exclusive-NOR gate output is HIGH when the inputs are unequal.
14   An OR gate output is HIGH only if all the inputs are HIGH.
15   A waveform can be enabled or disabled by both AND and OR gates.

Ans.   (1)(T), (2)(T), (3)(F), (4)(F), (5)(T), (6)(F), (7)(F), (8)(T), (9)(F), (10)(F), (11)(F), (12)(T), (13)(F), (14)(F), (15)(T)

(b)   Multiple Choice Questions:

1   The output will be a LOW for any case when one or more inputs are zero in a(n):
       (a)   OR gate
       (b)   NOT gate
       (c)   AND gate
       (d)   NAND gate

2   The logic gate that will have HIGH or "1" at its output when any one of its inputs is HIGH is a(n):
       (a)   OR gate
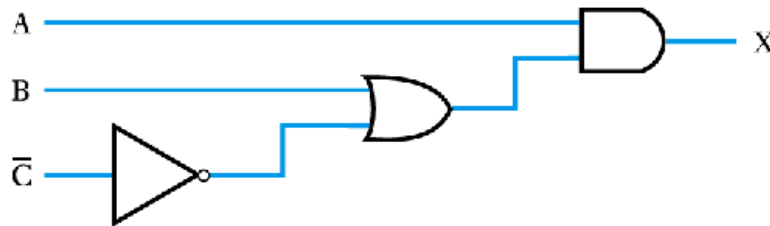   (b)   AND gate
       (c)   NOR gate

(d)   NOT gate

3   Which logic gate has the following truth table?

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(a)   An exclusive NOR gate.
(b)   A two-input AND gate.
(c)   An exclusive OR gate.
(d)   A two-input OR gate.

4   What Boolean expression describes the output X of this arrangement?

(a) $X = A.(B + C)$
(b) $X = (A.B) + C$
(c) $X = A + (B.C)$
(d) $X = A + B + C$

5   Express the binary number 1001 in decimal.
(a)   9
(b)   11
(c)   13
(d)   15

6   Express the decimal number 57 in binary.
(a)   110011
(b)   111001
(c)   111010
(d)   111101

7   Express the decimal number A7 in decimal.
(a)   169
(b)   167
(c)   257
(d)   87

8   Convert the hexadecimal number 59 into binary.

(a)   1011001
(b)   1010101
(c)   1101101
(d)   1001101

9   Convert the binary-coded decimal number 100001110101 into decimal.
(a)   2165
(b)   875
(c)   1353
(d)   683

10   1010 + 1010 =?
(a)   10100
(b)   10101
(c)   11100
(d)   10010

11   Computers use the _____ number system to store data and perform calculations.
(a)   Decimal
(b)   Hexadecimal
(c)   Binary
(d)   Octal

12   There are _____ bits in one byte.
(a)   4
(b)   8
(c)   16
(d)   32

13   The text code originally used in personal computers.
(a)   EBCDIC
(b)   Extended ASCII
(c)   Unicode
(d)   ASCII

14   In which of the following base systems is 123 not a valid number?
(a)   Base 10
(b)   Base 16
(c)   Base8
(d)   Base 3

15   Storage of 1 KB means the following number of bytes
(a)   1000
(b)   964
(c)   1024
(d)   1064.

16   What is the octal equivalent of the binary number: 10111101
      (a)   675
      (b)   275
      (c)   572
      (d)   573

17   The binary code of $(21.125)_{10}$ is
      (a)   10101.001
      (b)   10100.001
      (c)   10101.010
      (d)   10100.111

18   A NAND gate is called a universal logic element because
      (a)   It is used by everybody
      (b)   Any logic function can be realized by nand gates alone
      (c)   All the minization techniques are applicable for optimum nand gate realization
      (d)   Many digital computers use NAND gates.

19   Digital computers are more widely used as compared to analog computers, because they are
      (a)   Less expensive
      (b)   Always more accurate and faster
      (c)   Useful over wider ranges of problem types
      (d)   Easier to maintain.

20   Positive logic in a logic circuit is one in which
      (a)   Logic 0 and 1 are represented by 0 and positive voltage respectively
      (b)   Logic 0 and, -1 are represented by negative and positive voltages respectively
      (c)   Logic 0 voltage level is higher than logic 1 voltage level
      (d)   Logic 0 voltage level is lower than logic 1 voltage level.

21   Which interrupt has the highest priority?
      (a)   INTR
      (b)   TRAP
      (c)   RST6.5

22   In 8085 name the 16 bit registers?
      (a)   Stack pointer
      (b)   Program counter
      (c)   Both (a) and (b)

23   Which of the following is hardware interrupts?
      (a)   RST5.5, RST6.5, RST7.5
      (b)   INTR, TRAP
      (c)   a& b

24   What is the RST for the TRAP?
        (a)   RST5.5
        (b)   RST4.5
        (c)   RST4

25   What are level Triggering interrupts?
        (a)   INTR&TRAP
        (b)   RST6.5&RST5.5
        (c)   RST7.5&RST6.5

26   Which interrupt is not level sensitive in 8085?
        (a)   RST6.5 is a raising edge-trigging interrupt.
        (b)   RST7.5 is a raising edge-trigging interrupt.
        (c)   Both (a) and (b).
        (d)   None of Above

27   What are software interrupts?
        (a)   RST 0 - 7
        (b)   RST 5.5 - 7.5
        (c)   INTR, TRAP

28   Which stack is used in 8085?
        (a)   FIFO
        (b)   LIFO
        (c)   FILO

29   Why 8085 processor is called an 8 bit processor?
        (a)   Because 8085 processor has 8 bit ALU.
        (b)   Because 8085 processor has 8 bit data bus.
        (c)   Both (a) and (b).

30   What is SIM?
        (a)   Select Interrupt Mask
        (b)   Sorting Interrupt Mask
        (c)   Set Interrupt Mask.

31   Which amongst the following is not a logic gate?
        (a)   NAND
        (b)   NOR
        (c)   AND
        (d)   TTL

32   CPU is also called:
        (a)   Brain of Computer
        (b)   Memory of computer
        (c)   Monitor of computer

(d)   None of the Above

33   Which amongst the following is not an input device?
       (a)   Keyboard
       (b)   Mouse
       (c)   Joystick
       (d)   Printer

34   The complement of 10101_2 is:
       (a) 01010_2
       (b)   01101
       (c)   11010
       (d)   11101

35   The complement of 37_{10} is:
       (a) 62_{10}
       (b) 52_{10}
       (c) 48_{10}
       (d) 87_{10}

36   Commutative law states that:
       (a) $X + Y = Y + X$
       (b) $X + 0 = X$
       (c) $X + 1 = X$
       (d) $X . 1 = X$

37   Associative law states that:
       (a) $x + (y + z) = (x + y) + z$
       (b) $x.(y.z) = (x.y).z$
       (c)   Both (a) and (b)
       (d)   None of the above

38   Logical multiplication operator is known as:
       (a)   AND operator
       (b)   OR operator
       (c)   NOT operator
       (d)   None of the above

39   Which amongst the following is not a register?
       (a)   MAR
       (b)   MBR
       (c)   Accumulator
       (d)   RISC

40   A program counter holds:

(a)   Address of Next Instruction
(b)   Address of current instruction
(c)   Address of Previous Instruction
(d)   Address of Operand

41   The output of an AND gate with three inputs, A, B, and C, is HIGH when _____.
(a)   A = 1, B = 1, C = 0
(b)   A = 0, B = 0, C = 0
(c)   A = 1, B = 1, C = 1
(d)   A = 1, B = 0, C = 1

42   If a 3-input NOR gate has eight input possibilities, how many of those possibilities will result in a HIGH output?
(a)   1
(b)   2
(c)   7
(d)   8

43   If a signal passing through a gate is inhibited by sending a LOW into one of the inputs, and the Output is HIGH, the gate is a(n):
(a)   AND
(b)   NAND
(c)   NOR
(d)   OR

44   A device used to display one or more digital signals so that they can be compared to expected timing diagrams for the signals is a:
(a)   DMM
(b)   spectrum analyzer
(c)   logic analyzer
(d)   frequency counter

45   When used with an IC, what does the term "QUAD" indicate?
(a)   2 circuits
(b)   4 circuits
(c)   6 circuits
(d)   8 circuits

46   TTL operates from a
(a)   9-volt supply
(b)   3-volt supply
(c)   12-volt supply
(d)   5-volt supply

47   The switching speed of CMOS is now

(a) competitive with TTL

(b) three times that of TTL

(c) slower than TTL

(d) twice that of TTL

48 The power dissipation, P_D, of a logic gate is the product of the_____.
(a) dc supply voltage and the peak current
(b) dc supply voltage and the average supply current
(c) ac supply voltage and the peak current
(d) ac supply voltage and the average supply current

49 RIM is used to check whether, _____
(a) The write operation is done or not
(b) The interrupt is Masked or not
(c) a & b
(d) none of these

50 What does the small bubble on the output of the NAND gate logic symbol mean?
(a) Open collector output
(b) Tristate
(c) The output is inverted.
(d) None of the above

Ans. (1)(c), (2)(a), (3)(d), (4)(a), (5)(a), (6)(b), (7)(b), (8)(a), (9((b), (10)(a), (11)(c), (12)(b), (13)(d), (14)(d), (15)(d), (16)(b), (17)(a), (18)(b), (19)(c), (20)(d), (21)(c), (22)(c), (23)(c), (24)(b), (25)(b), (26)(b), (27)(a), (28)(b), (29)(a), (30)(c), (31)(d), (32)(a), (33)(d), (34)(a), (35)(a), (36)(a), (37)(c), (38)(a), (39)(d), (40)(a), (41)(c), (42)(a), (43)(b), (44)(c), (45)(b), (46)(d), (47)(a), (48)(b), (49)(b), (50)(c)

(c)   Fill in the Blanks:

1 Demorgan's law is _____.
2 The complement of $(xy' + x'y)$ is _____
3 The octal equivalent of decimal 39 is _____
4 Generally electronic circuits are classified as either digital or _____
5 Measurements of time, speed, weight, pressure are _____ in nature.
6 The OR gate can be converted to the NAND function by adding _____ to the inputs of the OR gate.
7 Adding an inverter to the output of an AND gate produces the _____ logic function.
8 The Boolean expression for a four input NOR gate is_____
9 _____ two-input NAND gates must be used to produce a two-input OR function.
10 The decimal equivalent of $(2F3)_{16}$ is _____

Ans.	(1) (AB)' = A' + B'/(A + B)' = A'B'), (2) (xy + x'y'), (3)(47), (4)(Analog), (5)(Analog), (6)(Inverters/Not gate), (7)(NAND), (8)(F = (A + B+C+D)', (9)(Three), (10)$(755)_{10}$)

**II	Short Answer Type Questions:**

1	How are subtraction and division performed in digital systems?
2	What is a gray code? How is it important?
3	Distinguish between 9's and 10's complements.
4	State and explain Basic Boolean Logic Operations.
5	What is meant by duality in Boolean algebra?
6	Prove Demorgan's theorems for a 3-Variable function.
7	Give the truth table and logic symbols for basic and universal gates.
8	Define analog and digital signals.
9	What is meant by overflow? Is it a software problem or a hardware problem?
10	Explain the term "Universal Gate".
11	Explain how the basic gates can be realized neither using NOR gates.
12	Find out the decimal equivalent of the following binary number:
	(a) 11011101	(b) 111	(c) 101100011	(d) 1000
13	Convert the following decimal number to octal numbers:
	(a) 13510	(b) 3210	(c) 169410	(d) 43510
14	Find the decimal equivalent of the following numbers:
	(a) 111.012	(b) 1001.0112	(c) 247.658	(d) A2B.D416
15	Why was BCD code extended to EBCDIC?
16	Give the full form of the following abbreviations:
	(a) BCD	(b) EBCDIC	(c) ASCII

**III	Long Answer Type Questions:**

1	Explain how the basic gates can be realized using universal gates.
2	What is a Hamming code and how is it used?
3	Explain odd and even parity check codes.
4	Explain addition and subtraction operations on signed binary numbers.
5	Explain the various buses in a microprocessor
6	Explain the architecture of 8085 microprocessor.
7	Discuss the Instruction set of 8085.
8	Discuss in detail why NAND & NOR are called Universal Gates.
9	Simplify (AB+C')(A+B+C')((A+B)'+C))' and implement using NAND gates only.
10	Simplify [(x +y) (x'+z)]' and neither implement using NOR gates only.
11	Give 9's complement of following decimal numbers
	a) 49
	b) 245
	c) 7865

2   Add following numbers using 2's complement method
         a) -48 and +31
         b) -64 and +46

13   Discuss different operations that can be performed by 8085 microprocessor.

14   Explain instruction set and its various formats available in 8085.

15   What are different Logic Gates. Present truth table of following gates:
       (i)   AND   (ii)   OR   (iii)   NOT

16   What is meant by duality in Boolean algebra?

17   Express the following Boolean expression in their product – of – sums form. Ensure that each term has all the literals.

(a) $\overline{A} + B.\overline{C}$ (b) $A.B + \overline{C}$ (c) $A + B + C$

(d) $\left(\overline{A.B}\right).\left(\overline{A.C} + \overline{B.C}\right)$ (e) $\left(A.B\right)\left(\overline{B} + \overline{C}\right)$ (f) $A + A.\overline{B} + \overline{A}.C$

18   Divide 11001_2 by 101_2.

UNIT - II

I   **Test Your Skills:**

(a)   **State Whether the Following Statements are True or False:**

1   Software does not wear out.
2   The data dictionary is a repository of various data flows defined in a DFD.
3   Statistically, the maximum percentage of errors belongs to design phase.
4   Use case approach was developed by I. Jacobson and others.
5   RAD stands for Relative Application Development.
6   Zero level DFD is known as context diagram...
7   Machine languages are very easy to program.
8   Assembly languages are machine dependent.
9   Cache memory has a large access time.
10   Magnet optical disks integrate optical and magnetic disk technologies.
11   Firmware is software that is embedded in a hardware device.
12   All operating systems are mutually compatible.
13   DOS is an example of GUI.
14   The boot program loads the operating system into the computer's main memory or random access memory (RAM).
15   An assembler takes basic computer instructions and converts them into a pattern of bits that the computer's processor can use to perform its basic operations.

Ans.   (1)(T), (2)(T), (3)(F), (4)(T), (5)(F), (6)(T), (7)(F), (8)(T), (9)(F), (10)(T), (11)(T), (12)(T), (13)(F), (14)(T), (15)(T)

(b)   Multiple Choice Questions:

1   Which of the following is called the "Brain of the Computer"?
(a)   Input Device
(b)   CPU
(c)   Output Device
(d)   Memory

2   RISC stands for:
(a)   Reduced Instruction Set Computer
(b)   Risk Integrated Source Code
(c)   Risk Included Specification Code
(d)   Reduced Instruction Set Cycle

3   A byte consists of:
(a)   1 bit
(b)   2 bits
(c)   4 bits
(d)   8 bits

4   A nibble consists of:
(a)   2 bits
(b)   4 bits
(c)   8 bits
(d)   16 bits

5   How many generations of computer are there?
(a)   1
(b)   2
(c)   4
(d)   5

6   RAID stands for:
(a)   Reduced Array of Information & Data
(b)   Random Identification
(c)   Reduced Array of Identical Disks
(d)   Redundant Array of Inexpensive Disks

7   Vacuum tubes were used in:
(a)   1 Generation Languages
(b)   2 Generation Languages
(c)   3 Generation Languages
(d)   4 Generation Languages

8   Hard disk is a:
(a)   Magnetic Device

(b)   Mechanical Device
(c)   Optical Device
(d)   Magneto-Optical Device

9   Mouse is a:
(a)   Input Device
(b)   Output Device
(c)   Storage Device
(d)   Point & Draw Device

10   Which of the following is used in the Banking Industry for the processing of cheques?
(a)   OMR
(b)   OCR
(c)   MICR
(d)   Bar Code

11   How   many   steps   are   in   the   systems   development   life   cycle   (SDLC)?
(a)   4
(b)   5
(c)   6
(d)   10

12   The first step in the systems development life cycle (SDLC) is:
(a)   Analysis.
(b)   Design.
(c)   Problem/Opportunity Identification.
(d)   Development and Documentation.

13   Most modern software applications enable you to customize and automate various
       features using small custom-built "miniprograms" called:
(a)   macros
(b)   code
(c)   routines
(d)   subroutines

   13 The organized process or set of steps that needs to be followed to develop an
       information system is known as the:
(a)   analytical cycle.
(b)   design cycle.
(c)   program specification.
(d)   system development life cycle.

14   How many steps are in the program development life cycle (PDLC)?
(a)   4
(b)   5
(c)   6

(d)   10

15   The make-or-buy decision is associated with the _____ step in the SDLC.
       (a)   Problem/Opportunity Identification
       (b)   Design
       (c)   Analysis
       (d)   Development and Documentation

16   In the Analysis phase, the development of the _____ occurs, which is a clear
       statement of the goals and objectives of the project.
       (a)   documentation
       (b)   flowchart
       (c)   program specification
       (d)   design

17   Actual programming of software code is done during the _____ step in the
       SDLC
       (a)   Maintenance and Evaluation
       (b)   Design
       (c)   Analysis
       (d)   Development and Documentation

18   Enhancements, upgrades, and bug fixes are done during the _____ step in the
       SDLC
       (a)   Maintenance and Evaluation
       (b)   Problem/Opportunity Identification
       (c)   Design
       (d)   Development and Documentation

19   The _____ determines whether the project should go forward
       (a)   Feasibility assessment
       (b)   Opportunity identification
       (c)   System evaluation
       (d)   Program specification

20   Technical writers generally provide the _____ for the new system.
       (a)   Programs
       (b)   Network
       (c)   Analysis
       (d)   Documentation

21   _____ design and implement database structures.
       (a)   Programmers
       (b)   Project managers
       (c)   Technical writers

(d)   Database administrators

22   _____ spend most of their time in the beginning stages of the SDLC, talking
with end-users, gathering information, documenting systems, and proposing solutions.
(a)   Systems analysts
(b)   Project managers
(c)   Network engineers
(d)   Database administrators

23   _____ manage the system development, assign staff, manage the budget and
reporting, and ensure that deadlines are met.
(a)   Project managers
(b)   Network engineers
(c)   Graphic designers
(d)   Systems analysts

24   _____ is the process of translating a task into a series of commands that a
computer will use to perform that task.
(a)   Project designs
(b)   Installation
(c)   Systems analysis
(d)   Programming

25   Debugging is:
(a)   Creating program code.
(b)   Finding and correcting errors in the program code.
(c)   Identifying the task to be computerized.
(d)   Creating the algorithm.

26   Translating the problem statement into a series of sequential steps describing what the
program must do is known as:
(a)   Coding.
(b)   Debugging.
(c)   Creating the algorithm.
(d)   Writing documentation.

27   Translating the algorithm into a programming language occurs at the _____
step of the PDLC
(a)   Debugging
(b)   Coding
(c)   Testing and Documentation
(d)   Algorithm Development

28   The problem statement should include all of the following EXCEPT:
(a)   Input
(b)   Output

(c)   Processing
(d)   Storage

29   The problem statement includes the _____, which lists specific input numbers
        a program would typically expect the user to enter and precise output values that a
        perfect program would return for those input values.
        (a)   Testing plan
        (b)   Error handler
        (c)   IPO cycle
        (d)   Input-output specification

31   What is a light pen?
        (a)   A Mechanical Input device
        (b)   Optical input device
        (c)   Electronic input device
        (d)   Optical output device

32   ....is a combination of hardware and software that facilitates the sharing of
        information between computing devices.
        (a)   network
        (b)   peripheral
        (c)   expansion board
        (d)   digital device

33   Coded entries which are used to gain access to a computer system are called
        (a)   Entry codes
        (b)   Passwords
        (c)   Security commands
        (d)   Code words

34.   Which of the following statements is true ?
        (a)   Minicomputer works faster than Microcomputer
        (b)   Microcomputer works faster than Minicomputer
        (c)   Speed of both the computers is the same
        (d)   The speeds of both these computers cannot be compared with the speed of
                advanced

35.   You organize files by storing them in
        (a)   archives
        (b)   folders
        (c)   indexes
        (d)   lists

36.   What type of resource is most likely to be a shared common resource in a computer
        Network?
        (a)   Printers
        (b)   Speakers

(c) Floppy disk drives
(d) Keyboards

37 ALU is
    (a) Arithmetic Logic Unit
    (b) Array Logic Unit
    (c) Application Logic Unit
    (d) None of above

38. VGA is
    (a) Video Graphics Array
    (b) Visual Graphics Array
    (c) Volatile Graphics Array
    (d) Video Graphics Adapter

39. IBM 1401 is
    (a) First Generation Computer
    (b) Second Generation Computer
    (c) Third Generation Computer
    (d) Fourth Generation Computer

40. Which device is required for the Internet connection?
    (a) Joystick
    (b) Modem
    (c) CD Drive
    (d) NIC Card

41 The phenomenon of having a continuous glow of a beam on the screen even after it is removed is called as ?
    (a) Fluorescence
    (b) Persistence
    (c) Phosphorescence
    (d) Incandescence

42 Smallest size object that can be displayed on a monitor is called.....................
    (a) Picture element
    (b) Point
    (c) Dot Pitch
    (d) aspect ratio

43 On a monochromatic monitor, the frame buffer is known as ....
    (a) Display file
    (b) Pixmap
    (c) Bitmap
    (d) Refresh buffer

44   .... refers to pixel spacing.
- (a)   Pixmap
- (b)   Resolution
- (c)   Pixel depth
- (d)   Persistence

45   The distance from one pixel to the next pixel is called ....
- (a)   Resolution
- (b)   Dot Pitch
- (c)   Pixmap
- (d)   ppi

46   Hue of a color is related to
- (a)   Luminance
- (b)   Saturation
- (c)   Incandescence
- (d)   Wavelength

47   The ratio of horizontal points to vertical points necessary to produce equal length lines in both direction.
- (a)   Dot Pitch
- (b)   Resolution
- (c)   Aspect Ratio
- (d)   Height-Width Ratio

48   A data flow can

- (a)   Only emanate from an external entity
- (b)   Only terminate in an external entity
- (c)   May emanate and terminate in an external entity
- (d)   May either emanate or terminate in an external entity but not both

49   Which of the following can be defined as most recent and perhaps the most comprehensive technique for solving computer problems.
- (a)   System Analysis
- (B)   System Data
- (c)   System Procedure
- (d)   System Record

50   Which of the following is an important factor of management information system.
- (a)   System
- (b)   Data
- (c)   Process
- (d)   All

Ans. (1)(c), (2)(a), (3)(d), (4)(b), (5)(d), (6)(d), (7)(a), (8)(a), (9)(a and d), (10)(c), 11)(c), (12)(c), (13)(a), (14)(d), (15)(b), (16)(b), (17)(c), (18)(d), (19)(a), (20)(a), (21)(d), (22)(d), (23)(a), (24)(a), (25)(d), (26)(b), (27)(c), (28)(b), (29)(d), (30)(a), (31)(b), (32)(a), (33)(b), (34)(a), (35)(b), (36)(a), (37)(a), (38)(a), (39)(b), (40)(d), (41)(c), (42)(b), (43)(c), (44)(b), (45)(a), (46)(d), (47)(c), (48) (c), (49)(a), (50)(d)

(c)   Fill in the Blanks:

1   GUI stands for _____.
2   The activity of processing data using a computer is called _____.
3   _____ is known as the father of modern digital computers.
4   The _____ allows data and instructions to be fed to the computer system from the outside world in computer acceptable form.
5   _____ are character printers that form characters and all kinds of images as a pattern of dots.
6   _____ refers to a set of computer programs, procedures and associated documents.
7   _____ and _____ are the two types of softwares.
8   _____ is a step-by-step description of how to arrive at a solution of the given problem.
9   _____ is a pictorial representation of an algorithm.
10   RAM is a _____ memory. (volatile/non-volatile)

Ans   (1)(Graphical User Interface), (2)(Data Processing), (3)(Charles Babbage), (4)(Input device), (5)(Dot matrix printers), (6)(Software), (7)(System software and Application software), (8)(Algorithm), (9)(Flow chart), (10)(Volatile)

II   Short Answer Type Questions:

1   List out and explain some of the important characteristics of a computer.
2   What are the five basic operations performed by any computer?
3   What are registers? Name some of the commonly used registers.
4   What are the two main components of the CPU of a computer system?
5   List out key features of RISC and CISC processors.
6   Differentiate between bit, byte and word.
7   What is a bus? Why is it required in a computer?
8   Write the full form of following:
    (a)   RAM   (g)   UVEPROM
    (b)   ROM   (h)   DMA
    (c)   MAR   (i)   MB
    (d)   MBR   (j)   PROM
    (e)   GB   (k)   CISC
    (f)   SRAM   (l)   DRAM

9   What is a parity bit? How is it used for detecting errors?
10   What is IRG? Why is it needed?
11   Define the following in context of disk storage:

(a)   Access time
(b)   Seek time
(c)   Latency
(d)   Transfer rate

12   Define the terms hardware and software.
13   Both DO…WHILE and REPEAT…UNTIL are used for looping. Discuss the difference between the two.
14   Discuss the advantages and limitations of pseudo code.
15   Draw a flowchart to add up all even numbers between 0 and 100.
16   What is an input interface? How it differs from output interface.
17   Explain with diagram the meaning of SDLC
18   Differentiate between compiler and interpreter.
19   Explain the different symbols used in flowchart. Draw a flowchart to print the sum of first ten Multipliers of 5.
20   Describe the various types of memories used in computer systems.
21   What are decision tables and decision trees? Explain with an example of each.
22   What is SDLC? Describe all the stages of SDLC. Explain briefly the different levels of testing.
23   Explain the Prototype Model for software development with diagram.

III   **Long Answer Type Questions:**

1   Explain the memory hierarchy of a computer system.
2   Explain in detail the various input and output devices.
3   What are compilers and interpreters? Discuss their relative advantages and disadvantages.
4   Explain the stages of software development.
5   Explain the functionality of CRT.
6   Explain the different language converters.
7   What are external storage devices? Explain in detail.
8   What is the difference between Raster scan & random scan?
9   Discuss the working of LCD.
10   Explain the difference between testing and debugging.
11   Explain the difference between primary & secondary storage devices in detail.
12   Differentiate among RAM, ROM, PROM and EPROM, Cache Memory.
13   Distinguish between a sequential access, a direct access, and a random access storage device. Give one example of each.
14   In the context of magnetic disk storage, define the following terms and give the relationship among them (if any):
(a) Truck   (b) Cylinder   (c) Sector   (d) Risk address
15   What is an automated tape library? What are its main components? How are these components used together to provide a mass storage device? List out some typical uses of an automated tape library.
16   What are data scanning devices? How do they help in improving input data accuracy as compared to keyboard devices?

UNIT - III

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   Thread is a program in execution.
2   I/O bounce jobs normally input vast amount of data, perform little computation and output large amount of information.
3   Memory management is not the functionality of operating system.
4   Traditional processes are called light weight processes and threads are called heavy-weight processes.
5   Spooling is a mechanism to reduce the speed mismatch between slow I/O devices and CPU.
6   File is a collection of unrelated information.
7   Multitasking is a system that must satisfy the requirement of producing the desired results before a certain deadline.
8   Unix is a multi-user, time sharing operating system.
9   Data definition language (DDL) is used to define the structure of a database.
10   Data Manipulation Language (DML) includes commands that enable users to enter and manipulate data.
11   The basic unit of dispatch in an operating system is usually referred to as a thread or lightweight process.
12   An operating system can have both microkernel and virtual machine structures.
13   A **microkernel** (also known as *μ-kernel*) is the near-minimum amount of software that can provide the mechanisms needed to implement an operating system.
14   Storage media that is operated directly from computer's central processing unit is considered as primary storage.
15   Inter-process communication (IPC) is any mechanism which allows separate processes to communicate with each other, usually by sending messages.

Ans.   (1)(F), (2)(T), (3)(F), (4)(F), (5)(T), (6)(F), (7)(F), (8)(T), (9)(T), (10)(T), (11)(T), (12)(T), (13)(T), (14)(T), (15)(T)

(b)   Multiple Choice Questions:

1   Round robin scheduling is essentially the preemptive version of _____.
       (a)   FIFO
       (b)   Shortest job first
       (c)   Shortest remaining
       (d)   Longest time first

2   A page fault occurs
       (a)   when the page is not in the memory

(b)   when the page is in the memory
(c)   when the process enters the blocked state
(d)   when the process is in the ready state

3   Which of the following will determine your choice of systems software for your computer?
     (a)   Is the applications software you want to use compatible with it?
     (b)   Is it expensive?
     (c)   Is it compatible with your hardware?
     (d)   Both a and c

4   What is a shell?
     (a)   It is a hardware component
     (b)   It is a command interpreter
     (c)   It is a part in compiler
     (d)   It is a tool in CPU scheduling

5   The Hardware mechanism that enables a device to notify the CPU is called _____.
     (a)   Polling
     (b)   Interrupt
     (c)   System Call
     (d)   None of the above

6   Routine is not loaded until it is called. All routines are kept on disk in a relocatable load format. The main program is loaded into memory & is executed. This type of loading is called _____
     (a)   Static loading
     (b)   Dynamic loading
     (c)   Dynamic linking
     (d)   Overlays

7   In the blocked state
     (a)   the processes waiting for I/O are found
     (b)   the process which is running is found
     (c)   the processes waiting for the processor are found
     (d)   none of the above

8   What is the memory from aK - 6d0K called?
     (a)   Extended Memory
     (b)   Normal Memory
     (c)   Low Memory
     (d)   Conventional Memory

9   Virtual memory is _____.
     (a)   An extremely large main memory

(b)   An extremely large secondary memory

(c)   An illusion of extremely large main memory

(d)   A type of memory used in super computers.

10   The process related to process control, file management, device management, information about system and communication that is requested by any higher level language can be performed by _____.

(a)   Editors

(b)   Compilers

(c)   System Call

(d)   Caching

11   In the running state

(a)   Only the process which has control of the processor is found

(b)   All the processes waiting for I/O to be completed are found

(c)   All the processes waiting for the processor are found

(d)   None of the above

12   Multiprogramming systems _____.

(a)   Are easier to develop than single programming systems

(b)   Execute each job faster

(c)   Execute more jobs in the same time

(d)   Are used only on large main frame computers

13   Which is not the state of the process?

(a)   Blocked

(b)   Running

(c)   Ready

(d)   Privileged

14   The solution to Critical Section Problem is: Mutual Exclusion, Progress and Bounded Waiting.

(a)   The statement is false

(b)   The statement is true.

(c)   The statement is contradictory.

(d)   None of the above

15   A thread

(a)   is a lightweight process where the context switching is low

(b)   is a lightweight process where the context switching is high

(c)   is used to speed up paging

(d)   none of the above

16   The state of a process after it encounters an I/O instruction is _____.

(a)   Ready

(b)   Blocked/Waiting

(c) Idle
(d) Running

17 The number of processes completed per unit time is known as _____.
(a) Output
(b) Throughput
(c) Efficiency
(d) Capacity

18 _____ is the situation in which a process is waiting on another process, which is also waiting on another process ... which is waiting on the first process. None of the processes involved in this circular wait are making progress.
(a) Deadlock
(b) Starvation
(c) Dormant
(d) None of the above

19 Which of the following file name extension suggests that the file is Backup copy of another file ?
(a) TXT
(b) COM
(c) BAS
(d) BAK

20 Which technique was introduced because a single job could not keep both the CPU and the I/O devices busy?
(a) Time-sharing
(b) Spooling
(c) Preemptive scheduling
(d) Multiprogramming

21 A critical region
(a) is a piece of code which only one process executes at a time
(b) is a region prone to deadlock
(c) is a piece of code which only a finite number of processes execute
(d) is found only in Windows NT operation system

22 The mechanism that bring a page into memory only when it is needed is called _____
(a) Segmentation
(b) Fragmentation
(c) Demand Paging
(d) Page Replacement

23 PCB is
(a) Program Control Block

(b)   Process Control Block
(c)   Process Communication Block
(d)   None of the above

24   FIFO scheduling is _____.
     (a)   Preemptive Scheduling
     (b)   Non Preemptive Scheduling
     (c)   Deadline Scheduling
     (d)   Fair share scheduling

25   Switching the CPU to another Process requires to save state of the old process and loading new process state is called as _____.
     (a)   Process Blocking
     (b)   Context Switch
     (c)   Time Sharing
     (d)   None of the above

26   The Entity Relationship model comes under:
     (a)   Object based logical model
     (b)   Record based logical model
     (c)   Physical data model
     (d)   None

27   The column of a table is referred to as:
     (a)   Tuple
     (b)   Attribute
     (c)   Entity
     (d)   Degree

28   Student and courses enrolled, is an example of:
     (a)   One to one relationship
     (b)   One to many
     (c)   Many to one
     (d)   Many to many

29   Redundancy is dangerous as it is potential threat to data:
     (a)   Integrity
     (b)   Consistency
     (d)   Sufficiency
     (d)   None

30   An attribute of one table matching the primary key of another table is called:
     (a)   Foreign key
     (b)   Secondary key
     (c)   Candidate key
     (d)   Composite key

31   The term 'page traffic' describes
        (a)   number of pages in memory at a given instant.
        (b)   number of papers required to be brought in at a given page request.
        (c)   the movement of pages in and out of memory.
        (d)   number of pages of executing programs loaded in memory.

32   The "turn-around" time of a user job is the
        (a)   time since its submission to the time its results become available.
        (b)   time duration for which the CPU is allotted to the job.
        (c)   total time taken to execute the job.
        (d)   time taken for the job to move from assembly phase to completion phase.

32   Round robin scheduling is essentially the preemptive version of _____.
        (a)   FIFO
        (b)   Shortest job first
        (c)   Shortes remaining
        (d)   Longest time first

33   Which of the following will determine your choice of systems software for your computer ?

        (a)   Is the applications software you want to use compatible with it ?
        (b)   Is it expensive?
        (c)   Is it compatible with your hardware?
        (d)   Both 1 and 3

34   Which technique was introduced because a single job could not keep both the CPU and the I/O devices busy?
        (a)   Time-sharing
        (b)   SPOOLing
        (c)   Preemptive scheduling
        (d)   Multiprogramming

35   Routine is not loaded until it is called. All routines are kept on disk in a relocatable load format. The main program is loaded into memory & is executed. This type of loading is called _____
        (a)   Static loading
        (b)   Dynamic loading
        (c)   Dynamic linking
        (d)   Overlays

36   DBMS stands for_____?
        (a)   Data blocking and Management Systems
        (b)   Database Management Systems
        (c)   Database Business Management Systems
        (d)   None of the above

37 What is the name of the system database that contains descriptions of the data in the database?
    (a) Metadata
    (b) Data dictionary
    (c) Table
    (d) None of the above

38 IMS stands for _____
    (a) Information Management System
    (b) Internal Mechanical Security
    (c) International Managers Society
    (d) None of the above

39 Which of the following is the oldest database model?
    (a) Hierarchical
    (b) Network
    (c) Relational
    (d) Object Oriented

40 Which category of users need not be aware of the presence of the database system?
    (a) DBA
    (b) Naive
    (c) Casual
    (d) Application Programmers

41 The part of machine level instruction, which tells the central processor what has to be done, is
    (a) Operation code
    (b) Address
    (c) Flip-Flop
    (d) None of the above

42 Which of the following refers to the associative memory?
    (a) The address of the data is generated by the CPU
    (b) The address of the data is supplied by the users
    (c) There is no need for an address i.e. the data is used as an address
    (d) The data are accessed sequentially
    (e) None of the above

43 To avoid the race condition, the number of processes that may be simultaneously inside their critical section is

(a)   8

(b)   1

(c)   16

(d)   0

44   DEL command is used to
   (a)   Delete files
   (b)   Delete directory
   (c)   Delete labels
   (d)   Delete contents of file

45   Which command be used to ask you to confirm that you want to delete the directory?
   (a)   Deltree
   (b)   Deltree/f
   (c)   Del *.*/p
   (d)   Erase *.*

46   DIR command is used to
   (a)   Display a list of files in a directory
   (b)   Display contents of files in directory
   (c)   Display type of files in a sub directory
   (d)   All of above

47   The deleted file in MS-DOS can be recovered if you use the command mention below immediately, the command is:
   (a)   DO NOT DELETE
   (b)   NO DELETE
   (c)   UNDELETE
   (d)   ONDELETE

48   Technique which is used to retrieve data from disk in form of continuous blocks of stream and eliminates seek time is classified as
   (a)   concurrent buffering
   (b)   parallel buffering
   (c)   single buffering
   (d)   double buffering

49   Which of the following is a unique tag, usually a number, identifies the file within the file system.
   (a)   File identifier
   (b)   File name
   (c)   File type
   (d)   none of the mentioned

50   A unit of storage that can store one or more records in a hash file organization is denoted as

(a)   Buckets
(b)   Disk pages
(c)   Blocks
(d)   Nodes

Ans.   (1)(a), (2)(a), (3)(d), (4)(b), (5)(b), (6)(c), (7)(a), (8)(d), (9)(c), (10)(c), (11)(a), (12)(c), (13)(d), (14)(b), (15)(a), (16)(b), (17)(b), (18)(a), (19)(d), (20)(d), (21)(a), (22)(c), (23)(b), (24)(b), (25)(a), (26)(a), (27)(b), (28)(d), (29)(a & b), (30)(a), (31)(c), (32)(c), (33)(a), (34)(d), (35)(b), (36)(b), (37)(b), (38)(a), (39)(a), (40)(b), (41)(a), (42)(c), (43)(b), (44)(d), (45)(c), (46)(d), (47)(c), (48)(d), (49)(a), (50)(a).

(c)   Fill in the Blanks:

1   _____ is the interval from the time of submission of a job to the system for processing to the time of completion of the job.
2   A _____ is a program is execution.
3   In a _____system only job is processed by the system at a time and all the system resources are exclusively available for the job until it completes.
4   _____mostly perform numerical calculations, with little I/O operations.
5   _____ is the concurrent execution of multiple jobs in a single user system.

6   A _____ defines the manner in which the various files of a database are linked together.
7   The four major components of a DBMS are _____, _____, _____ & _____.
8   _____, _____ & _____ are the three commonly used file organizations in business data processing applications.
9   _____ is used to uniquely identify a relation.
10   Unix is having a _____ kernel. (monolithic/micro)

Ans.   (1) (Turnaround time), (2) (Process), (3) (Uni-processing), (4) (CPU bound jobs), (5) (Multitasking), (6) (Database model), (7) (DDL, DML, query language and report generator) (8) (Sequential, direct and indexed sequential), (9) (Primary key), (10) (monolithic)

II   Short Answer Type Questions:

1   What is an operating system? Why is it necessary for a computer system?
2   Define the following terms:
           (a) Throughput
           (b) Turnaround time
3   What is a process in a computer system? What are the various states in which a process can be?
4   What is batch processing? How are jobs typically executed in a batch processing system?
5   Differentiate between I/O bound and CPU bound jobs.

6	What is a PCB? What does it typically contain?
7	What is time sharing? What is a time slice?
8	Differentiate between sequential access and random access files..
9	What is memory fragmentation problem? Differentiate between internal and external fragmentation.
10	What is a database? How is it different from file?
11	What is a file management system?
12	What is a database model? Name the four commonly used database models.
13	What is the difference between a master file and a transaction file?
14	What is data integrity problem and how DB approach overcomes it?
15	What are the responsibilities of a database administration (DBA)?
16	Elaborate the differences between Traditional file system and DBMS.
17	How does a short-term scheduler work?
18	Define turnaround and wait-times.
19	How does a process differ from a program?
20	Define the following terms:

   (a)   Data independence
   (b)   Query processor
   (c)   DDL processor
   (d)   DML processor
   (e)   Run time database manage.

| 21 | How is traditional file processing approach different than DBMS approach? Explain. |

III   Long Answer Type Questions:

1   Explain the role of an operating system w.r.t. following:
   (a)   Process management
   (b)   Memory Management
   (c)   File management
   (d)   Security
   (e)   Command Interpretation

2   What is the difference between a uni-programming system and a multiprogramming system? What are their relative advantages and disadvantages?

3   What are the different types of operating system?

4   Explain the various data models with the help of examples.

5   What are the four major components of a database management system?

6   Explain different DOS commands in detail.

7   What is an operating system? Explain its functions regarding memory management and file management.

8   What is multithreading? How threads are different from a process?

9   Explain the 3-tier architecture of database management system?

10   Give the layered architecture of operating system.

11   Degree of multiprogramming controls the performance of the computing system." – Comment.

UNIT - IV

I **Test Your Skills:**

(a) **State Whether the Following Statements are True or False:**

1   Routers are used in the Data Link Layer.
2   There are five classes of IP addresses.
3   Bridges are used to connect different types of LAN.
4   Error rate is high in LAN's.
5   Error control is done at Data Link Layer.
6   Twisted pair is used in Telephone System.
7   Presentation layer deals with the syntax and semantics.
8   Modem acts only as a modulator.
9   For communication to proceed, only a sender is required.
10   MAN, MAN and WAN are the types of computer network.
11   Attenuation is highest in UTP cable.
12   Multipath fading is not a serious problem in Microwave Communication systems.
13   In DPSK, the information in the two consecutive bits is used.
14   In a mesh topology, the relationship between one device and another is primary-to-peer.
15   A cable break in a bus topology stops all transmission.

Ans.   (1)(F), (2)(T), (3)(T), (4)(F), (5)(T), (6)(T), (7)(T), (8)(F), (9)(F), (10)(T), (11)(F), (12)(F), (13)(T), (14)(F), (15)(T)

(b) **Multiple Choice Questions:**

1   Which of the following is considered a broad band communication channel?
         (a)   Coaxial cable
         (b)   Fiber optics cable
         (c)   Microwave circuits
         (d)   All of above

2   Which of the following is not a transmission medium?
         (a)   Telephone lines
         (b)   Coaxial cables
         (c)   Modem
         (d)   Microwave systems

3   Which of the following is an advantage to using fiber optics data transmission?
         (a)   Resistance to data theft
         (b)   Fast data transmission rate
         (c)   Low noise level
         (d)   All of above

4   Which of the following is required to communicate between two computers?

(a)   Communications software
(b)   Protocol
(c)   Communication hardware
(d)   All of above including access to transmission medium

5   Which of the following performs modulation and demodulation?
(a)   Fiber optics
(b)   Satellite
(c)   Coaxial cable
(d)   Modem

6   The process of converting analog signals into digital signals so they can be processed by a receiving computer is referred to as:
(a)   Modulation
(b)   Demodulation
(c)   Synchronizing
(d)   Digitizing

7   Which of the following communication modes support two-way traffic but in only one direction at a time?
(a)   Simplex
(b)   half duplex
(c)   three-quarters duplex
(d)   all of the above

8   Which of the following might be used by a company to satisfy its growing communications needs?
(a)   Front end processor
(b)   Multiplexer
(c)   Controller
(d)   Concentrator
(e)   All of the above

9   Which data communication method is used to transmit the data over a serial communication link?
(a)   Simplex
(b)   Half-duplex
(c)   Full-duplex
(d)   None of above

10   What is the minimum number of wires needed to send data over a serial communication link layer?
(a)   1
(b)   2
(c)   4
(d)   6

11   Which of the following types of channels moves data relatively slowly?
        (a)   wide band channel
        (b)   voice band channel
        (c)   narrow band channel

12   Most data communications involving telegraph lines use:
        (a)   Simplex lines
        (b)   Wideband channel
        (c)   Narrowband channel
        (d)   Dialed service

13   A communications device that combines transmissions from several I/O devices into one line is :-
        (a)   Concentrator
        (b)   Modifier
        (c)   Multiplexer
        (d)   Full-duplex line

14   Which of the following communications lines is best suited to interactive processing applications?
        (a)   narrow band channel
        (b)   simplex lines
        (c)   full duplex lines
        (d)   mixed band channels

15   Which of the following is an advantage to using fiber optics data transmission?
        (a)   resistance to data theft
        (b)   fast data transmission rate
        (c)   low noise level
        (d)   all of above

16   Which of the following is required to communicate between two computers?
        (a)   communications software
        (b)   protocol
        (c)   communication hardware
        (d)   all of above including access to transmission medium

17   The frequency range of the waves is:-
        (a)   150-285 Hz
        (b)   up to 1605 Hz
        (c)   150-285 Hz

18   ISDN stands for:-
        (a)   Integrated services digital network
        (b)   Integral severe digital network
        (c)   Integrated several digital network

19   Which was the first satellite launched by COMSAT_____
        (a)   Early bird
        (b)   Intelsat I
        (c)   ATS-6

20   Early Bird was launched in 1965.
        (a)   True
        (b)   False

21   Protocols are:
        (a)   Agreements on how communication is to proceed
        (b)   Logical communication channel
        (c)   Physical communication channel
        (d)   Communication model

22   The number of layers in the OSI model is:
        (a)   5
        (b)   6
        (c)   7
        (d)   8

23   Topology with highest reliability is :
        (a)   Bus
        (b)   Star
        (c)   Ring
        (d)   Mesh

24   Method of communication in which transmission takes place in both directions, but
        only in one direction at a time is :
        (a)   Simplex
        (b)   From wire circuit
        (c)   Full duplex
        (d)   Half duplex

25   Which of the following is not a type of modulation?
        (a)   Amplitude modulation
        (b)   Pulse modulation
        (c)   Frequency modulation
        (d)   Phase modulation

26   The _____ is the physical path over which a message travels.
        (a)   Protocol
        (b)   Medium
        (c)   Signal
        (d)   All the above

27   The information to be communicated in a data communications system is the _____.
      (a)   Medium
      (b)   Protocol
      (c)   Message
      (d)   Transmission

28   Frequency of failure and network recovery time after a failure are measures of the _____ of a network.
      (a)   Performance
      (b)   Reliability
      (c)   Security
      (d)   Feasibility

29   An unauthorized user is a network _____ issue.
      (a)   Performance
      (b)   Reliability
      (c)   Security
      (d)   All the above

30   Which topology requires a central controller or hub?
      (a)   Mesh
      (b)   Star
      (c)   Bus
      (d)   Ring

31   The packets of an internet message
      (a)   take a predetermined path
      (b)   take a path based on packet priority
      (c)   go along different paths based on path availability
      (d)   take the shortest path from source to destination

32   The time taken by internet packets
      (a)   can be predetermined before transmission
      (b)   may be different for different packets
      (c)   is irrelevant for audio packets

33   By an intranet we mean
      (a)   a LAN of an organization
      (b)   a Wide Area Network connecting all branches of an organization
      (c)   a corporate computer network
      (d)   a network connecting all computers of an organization and using the internet protocol

34   By an extranet we mean
      (a)   an extra fast computer network

(b)   the intranets of two co-operating organizations interconnected via a secure leased line

(c)   an extra network used by an organization for higher reliability

(d)   an extra connection to internet provided to co-operating organizati

35   World Wide Web
     (a)   is another name for internet
     (b)   world wide connection for computers
     (c)   a collection of linked information residing on computers connected by the internet
     (d)   a collection of world wide information

36   Among services available on the World Wide Web are
     (i)   Encryption
     (ii)   HTTP
     (iii)   HTML
     (iv)   Firewalls

     (a)   i and ii
     (b)   ii and iii
     (c)   iii and iv
     (d)   i and iv

37   A world wide web contains web pages
     (a)   residing in many computers
     (b)   created using HTML
     (c)   with links to other web pages
     (d)   residing in many computers linked together using HTML

38   A web page is located using a
     (a)   Universal Record Linking
     (b)   Uniform Resource Locator
     (c)   Universal Record Locator
     (d)   Uniformly Reachable Links

39   A URL specifies the following:
     (i)   protocol used
     (ii)   domain name of server hosting web page
     (iii)   name of folder with required information
     (iv)   name of document formatted using HTML
     (v)   the name of ISP

     (a)   i, ii, iii, iv
     (b)   ii, iii, iv, v
     (c)   i, iii, iv
     (d)   i, ii, iii, v

40   A search engine is a program to search
      (a)   for information
      (b)   web pages
      (c)   web pages for specified index terms
      (d)   web pages for information using specified search terms

41.   A network that needs human beings to manually route signals is called....
      (a)   Fiber Optic Network
      (b)   Bus Network
      (c)   T-switched network
      (d)   Ring network

42   The   data   unit   in   the   TCP/IP   data   link   layer   called   a
      (a)   Message
      (b)   Segment
      (c)   Datagram
      (d)   Frame

43   In mesh topology, every device has a dedicated topology of
      (a)   Multipoint linking
      (b)   Point to point linking
      (c)   None of Above
      (d)   Both a and b

44   Multipoint topology is
      (a)   Bus
      (b)   Star
      (c)   Mesh
      (d)   Ring

45   What is the full form of BGP?
      (a)   Border gateway Protocol
      (b)   Broadband gateway Protocol
      (c)   Broadband gateway Part
      (d)   None of the above

46   The size of an IP address is __ bits
      (a)   12
      (b)   16
      (c)   32
      (d)   64

47   ASK, PSK, FSK, and QAM are examples of _____ encoding.
      (a)   Digital-to-digital

(b)   Digital-to-analog
(c)   Analog-to –analog
(d)   Analog-to-digital

48   Unipolar, bipolar, and polar encoding are types of _____ encoding.
(a)   Digital-to-digital
(b)   Digital-to-analog
(c)   Analog-to-analog
(d)   Analog-to-digital

49   Which layer 1 devices can be used to enlarge the area covered by a single LAN
        segment?
        1.   Switch
        2.   NIC
        3.   Hub
        4.   Repeater
        5.   RJ45 transceiver
(a)   1 only
(b)   1 and 3
(c)   3 and 4
(d)   5 only

50   Which of the following describe router functions?
(a)   Packet switching
(b)   Packet filtering
(c)   Internetwork communication
(d)   Path selection
(e)   All of the above

Ans.   (1)(d), (2)(c), (3)(d), (4)(d), (5)(d), (6)(d), (7)(b), (8)(e), (9)(c), (10)(b), (11)(c), (12)(c),
        (13)(c), (14)(c), (15)(d), (16)(d), (17)(b), (18)(a), (19)(a), (20)(a), (21)(a), (22)(c),
        (23)(d), (24)(b), (25)(b), (26)(b), (27)(c), (28)(b), (29)(c), (30)(b), (31)(c), (32)(c),
        (33)(d), (34)(d), (35)(c), (36)(b), (37)(d), (38)(b), (39)(a), (40)(d), (41)(c), (42)(d),
        (43)(a), (44)(a), (45)(a), (46)(c), (47)(b), (48)(a), (49)(c), (50)(e)

(c)   Fill in the Blanks:

1   _____ is the range of frequencies that is available for transmission of data.
2   Three modes of transmitting data from one point to another are _____, _____,
        and _____.
3   The techniques of converting a digital signal into analog form are known as
        _____.
4   LAN stands for _____.
5   _____ are used to uniquely identify a computer on Internet.
6   IP address is a _____ bit address.

7 Routing is the functionality of _____ layer.

8 Hubs and repeaters are present in the _____ layer.

9 _____, _____, and _____ are types of guided media.

10 UTP stands for _____.

Ans. (1)(bandwidth), (2)(simplex, half duplex and full duplex), (3)(modulation), (4)(local area network), (5)(IP addresses), (6)(32 bit), (7)(Network), (8)(Physical), (9)(Coaxial cable, twisted pair & fiber optics), (10)(Unshielded Twisted Pair)

II Short Answer Type Questions:

1 What is a computer network? How is it useful?

2 Identify the basic elements of a communication system and the purpose of each.

3 Differentiate between simplex, half duplex and full duplex modes of data transmission.

4 Differentiate between narrowband, voice band and broadband communication channels.

5 What is a co-axial cable? Where is it used?

6 Explain how microwave systems can be used for communication between two distant stations.

7 What is an optical fiber? How is it used for data communications? What are its advantages?

8 What is a modem?

9 What is WAN? What is MAN?

10 What is a communication protocol?

11 Write short note on:
   (a) Microwave system
   (b) Routing techniques
   (c) LAN and WAN

12 How are communication satellites used? What are the possible advantages and limitations of using it?

13 Explain the term bandwidth.

14 Explain the functionality of Data Link Layer.

15 Explain the functionality of Application Layer.

16 What is the purpose of Gateways?

17 Describe the two basic methods of multiplexing.

18 Explain the three types of modulation used in signal transmission.

19 What is a distributed computing system?

20 Explain the mesh topology.

21 What is FTP? List the steps used to upload and download a file using FTP.

22 What is a newsgroup? How is it useful?

23 Give the merits and demerits of all the topologies.

24 Give full form of:
   (a) HTML   (b) URL   (c) HTTP
   (d) WWW   (e) FTP   (f) SGML

25 Briefly explain
   (a) Repeater

(b)   Bridge
    (c)   Router
    (d)   Gateway

III   Long Answer Type Questions:

1   Discuss the network topologies with their relative advantages and disadvantages.
2   Distinguish between LAN, MAN and WAN.
3   Explain guided media of transmission.
4   Discuss unguided media of transmission.
5   Explain the OSI model.
6   Distinguish between Guided and unguided media.
7   Explain various components of data communication systems.
8   Distinguish between asynchronous and synchronous data transmission.
9   What do you understand by WWW? Explain in detail.
10   Briefly explain
    (a)   Repeater
    (b)   Bridge
    (c)   Router
    (d)   Gateway
11   What is Internet? Give some uses of Internet. Also state the services provided by Internet.
12   What are the different types of data transmission media? Briefly explain them.
13   What do you mean by term Network Topologies? Briefly explain them.
14   Write short notes on any two of the following:-
        (a) IP Address
        (b) Modem
        (c) TCP

15   What is Internet? Give some uses of Internet. Also state the services provided by Internet.
16   Explain guided media using various examples.

QUESTION BANK

PROGRAMMING IN C

MCA 103

UNIT - I

I   **Test Your Skills:**

(a)   **State Whether the Following Statements are True or False:**

1. C Language is developed by Ken Thompson.
2. C Language is closely associated with Linux.
3. C Programs are not portable.
4. Every C Program should have the main () function.
5. Compiler executes a program even if the program contains warning messages.
6. A comment can be split in more than one line.
7. The source code for the UNIX operating system is in C.
8. The assembly language program is in alphanumeric symbols.
9. While inputting values through scanf (), & is required before a variable name.
10. The format string %g is used for float type.
11. The %s is used to format the string.
12. The loop for(; ;) is a non-working loop.
13. The for(; ;) loop with no arguments can be executed.
14. The loop for(a=1;a<20;a++) will be executed.
15. The while (1) is an infinite loop
16. The do-while loop must be terminated by a semi-colon.
17. In case {}is not defined, the default scope is one statement.

Ans.   (1)(F), (2)(F), (3)(F), (4)(T), (5)(T), (6)(T), (7)(T), (8)(T), (9)(T), (10)(T), (11)(T), (12)(F), (13)(T), (14)(F), (15)(T), (16)(T), (17)(T)

(b)   **Multiple Choice Questions:**

1. Which of the following language is predecessor to C Programming Language?
   (a)   A
   (b)   B
   (c)   C++
   (d)   JAVA

2. C programming language was developed by
   (a)   Dennis Ritchie
   (b)   Ken Thompson
   (c)   Bill Gates
   (d)   Peter Norton

3   C keywords are reserved words by
    (a)   A compiler
    (b)   An interpreter
    (c)   Header file
    (d)   b and c.

4   The variable name can be started with
    (a)   Underscore symbol (_)
    (b)   Asterisk symbol (*)
    (c)   Ampersand symbol (&)
    (d)   None of the above.

5   What is the result of 5>3 && 5<10?
    (a)   0
    (b)   1
    (c)   2

6   Which of the following is evaluated first?
    (a)   &&
    (b) ||
    (c)   !
    (d)   &

7   If the program completes executing successfully, what value should the function main()
    return?
    (a)   0
    (b)   1
    (c)   void
    (d)   main

8   What will be the value of c after execution of the program?
    #include<stdio.h>
    #include<conio.h>
    void main()
    {
    int a, b, c;
    a = 9;
    b = 10;
    c = (b < a || b > a);
    clrscr();
    printf("\n c = %d",c);
    }
    a.   c = 1,
    b.   c = 0;
    c.   c = -1;
    d.   None of the above.

9   The size of operator for an operand return the
        (a)   No of bits occupied by the operand.
        (b)   No of bytes occupied by the operand.
        (c)   No of words occupied by the operand.
        (d)   None of the above.

10   In type conversions, when one operand is unsigned int and the other operand is long it,
        (a)   Unsigned int operand will be converted into long int and the result will be long
                int.
        (b)   Both operands will be converted to unsigned long int and the result will be
                unsigned long int.
        (c)   Either a or b.
        (d)   Neither a nor b.

11   What will be the final values of x and y?
        #include<stdio.h>
        #include<conio.h>
        void main()
        {
        int x = 1, y = 1;
        clrscr();
        do while(x <= 8)
        {
        x++, y++;
        }while(y < = 5);
        printf("\n x = %d y = %d", xy);
        }

        (a)   x = 9 y =9
        (b)   x = 9 y =6
        (c)   x = 6 y =6
        (d)   None of the above.

12   A switch statement is used to
        (a)   Switch between functions in a program
        (b)   Switch from one variable to another variable
        (c)   To choose from multiple possibilities this may arise due to different values of a
                single variable
        (d)   To use switching variables.

13   Continue statement in control structures is used for
        (a)   Transferring the control to another block of the program.
        (b)   To exit out of the present loop.
        (c)   To continue with the next test condition of the loop.
        (d)   None of the above.

14   for(;;) is used for
      (a)   infinite looping
      (b)   loop to be executed for n times.
      (c)   loop to be executed until the program terminates.
      (d)   none of the above.

15   The output of the code below is
       #include <stdio.h>
      int x;
      void main()
      {
       if (x)
       printf("hi");
       else
       printf("how are u");
       }
      (a)   hi
      (b)   how are you
      (c)   Compile time error
      (d)   None of the mentioned

16   What is the output of this C code?
      #include <stdio.h>
      int main()
      {
      int a = 1, b = 1;
      switch (a)
      {
      case a*b:
      printf("yes ");
      case a-b:
      printf("no\n");
      break;
      }
      }
      (a)   yes
      (b)   no
      (c)   Compile time error
      (d)   yes no

17   The following code 'for(;;)' represents an infinite loop. It can be terminated by.
      (a)   break
      (b)   exit(0)
      (c)   abort()
      (d)   All of the mentioned

18   The keyword 'break' cannot be simply used within:
        (a)   do-while
        (b)   if-else
        (c)   for
        (d)   while

19   Which keyword is used to come out of a loop only for that iteration?
        (a)   break
        (b)   continue
        (c)   return
        (d)   None of the mentioned

20   What is the output of this C code?
        ```c
        #include <stdio.h>
        int main()
        {
        int a = 0, i = 0, b;
        for (i = 0;i < 5; i++)
        {
        a++;
        continue;
        }
        }
        ```
        (a)   2
        (b)   3
        (c)   4
        (d)   5

21   What is the output of this C code?
        ```c
        #include <stdio.h>
        void main()
        {
        int i = 0;
        if (i == 0)
        {
        printf("Hello");
        continue;
        }
        }
        ```
        (a)   Hello is printed infinite times
        (b)   Hello
        (c)   Varies
        (d)   Compile time error

22   What is the output of this C code?
        ```c
        #include <stdio.h>
        ```

```
int main()
{
printf("before continue ");
continue;
printf("after continue\n");
}
```
(a)   Before continue after continue
(b)   Before continue
(c)   After continue
(d)   Compile time error

23   The correct syntax for running two variables for loop simultaneously is.
(a)   for (i = 0; i < n; i++)
          for (j = 0; j < n; j += 5)
(b)   for (i = 0, j = 0;i < n, j < n; i++, j += 5)
(c)   for (i = 0; i < n;i++){ }
          for (j = 0; j < n;j += 5){ }
(d)   None of the mentioned

24   Which of the following cannot be used as LHS of the expression in for (exp1;exp2;
      exp3)?
(a)   Variable
(b)   Function
(c)   typedef
(d)   Macros

25   What is the output of this C code(When 1 is entered)?
```
#include <stdio.h>
void main()
{
int ch;
printf("enter a value btw 1 to 2:");
scanf("%d", &ch);
switch (ch)
{
 case 1:
printf("1\n");
 default:
 printf("2\n");
 }
 }
```

(a)   1
(b)   2
(c)   1 2
(d)   Run time error

26 How many times i value is checked in the below code?
```
#include <stdio.h>
int main()
{
int i = 0;
while (i < 3)
i++;
printf("In while loop\n");
}
```
(a) 2
(b) 3
(c) 4
(d) 1

27 The keyword used to transfer control from a function back to the calling function is
(a) Switch
(b) goto
(c) go back
(d) Return

28 How many times the program will print "India"?
```
#include<stdio.h>
int main()
{
printf("India");
main();
return 0;
}
```
(a) Infinite times
(b) 32767 times
(c) 65535 times
(d) Till stack overflows

29 What is the output of this C code?
```
#include <stdio.h>
void main()
{
double k = 0;
for (k = 0.0; k < 3.0; k++);
printf("%lf", k);
}
```
(a) 2.000000
(b) 4.000000
(c) 3.000000
(d) Run time error

30   What is the output of this C code?
```
#include <stdio.h>
int main()
{
int i = 0;
for (; ; ;)
printf("In for loop\n");
printf("After loop\n");
}
```
(a)   Compile time error
(b)   Infinite loop
(c)   After loop
(d)   Undefined behavior

31   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
char c=125;
c=c+10;
printf("%d",c);
return 0;
}
```
(a) 135
(b) +INF
(c) -121
(d) -8

32   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
float a=5.2;
if(a==5.2)
printf("Equal");
else if(a<5.2)
 printf("Less than");
 else
printf("Greater than");
return 0;
}
```
(a)   Equal
(b)   Less than
(c)   Greater than
(d)   Compiler error

33   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
```

```
int main(){
int i=4,x;
x=++i + ++i + ++i;
printf("%d",x);
return 0;
}
```
(a)   21
(b)   18
(c)   12
(d)   Compiler error

34   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
 int a=2;
 if(a==2){
 a=~a+2<<1;
printf("%d",a);
}
else{
 break;
}
return 0;
}
```
(a)   It will print nothing.
(b)   -3
(c)   -2
(d)   Compiler error

35   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
 int a=10;
 printf("%d %d %d", a, a++, ++a);
 return 0;
}
```
(a)   12 11 11
(b)   12 10 10
(c)   11 11 12
(d)   10 10 12

36   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
char *str="Hello world";
 printf("%d",printf("%s",str));
```

```
 return 0;
}
```
(a)   11Hello world
(b)   10Hello world
(c)   Hello world10
(d)   Hello world11

37   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
printf("%d",sizeof(5.2));
return 0;
}
```
(a)   2
(b)   4
(c)   8
(d)   10

38   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
int i=10;
static int x=i;
if(x==i)
printf("Equal");
else if(x>i)
printf("Greater than");
else
printf("Less than");
return 0;
}
```
(a)   Equal
(b)   Greater than
(c)   Less than
(d)   Compiler error

39   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
int main(){
int array[]={10,20,30,40};
printf("%d",-2[array]);
return 0;
}
```
(a)   -60
(b)   -30
(c)   60

(d)   Garbage value

40.   What will be output if you will compile and execute the following c code?
```
#include <stdio.h>
#include <string.h>
int main(){
 char c='\08';
 printf("%d",c);
 return 0;
 }
```
(a)   8
(b)   8.
(c)   9
(d)   Compiler error

41   Variable names beginning with underscore is not encouraged. Why?
(a) It is not standardized
(b) To avoid conflicts since assemblers and loaders use such names
(c) To avoid conflicts since library routines use such names
(d) To avoid conflicts with environment variables of an operating system

42   All keywords in C are in
(a) LowerCase letters
(b) UpperCase letters
(c) CamelCase letters
(d) None

43   Variable name resolving (number of significant characters for uniqueness of variable) depends on
(a) Compiler and linker implementations
(b) Assemblers and loaders implementations
(c) C language
(d) None

44   Which of the following is not a valid C variable name?
(a) int number;
(b) float rate;
(c) int variable_count;
(d) int $main;

45   Which of the following is true for variable names in C?
(a) They can contain alphanumeric characters as well as special characters
(b) It is not an error to declare a variable to be one of the keywords(like goto, static)
(c) Variable names cannot start with a digit
(d) Variable can be of any length

46   Which of the following is a User-defined data type?
        (a) typedef int Boolean;
        (b) typedef enum {Mon, Tue, Wed, Thu, Fri} Workdays;
        (c) struct {char name[10], int age};
        (d) all of the mentioned

47   What is the size of an int data type?
        (a) 4 Bytes
        (b) 8 Bytes
        (c) Depends on the system/compiler
        (d) Cannot be determined

48   What is the output of this C code?
        #include <stdio.h>
        int main()
        {
        signed char chr;
        chr = 128;
        printf("%d\n", chr);
        return 0;
        }
        (a) 128
        (b) -128
        (c) Depends on the compiler
        (d) None of the mentioned

49   What is short int in C programming?
        (a) Basic datatype of C
        (b) Qualifier
        (c) short is the qualifier and int is the basic datatype
        (d) All of the mentioned

50   What will be the value of d in the following program?
        #include <stdio.h>
        int main()
        {
        int a = 10, b = 5, c = 5;
        int d;
        d = b + c == a;
        printf("%d", d);
        }

        (a) Syntax error
        (b) 1
        (c) 5
        (d) 10

Ans.   (1)(b), (2)(a), (3)(d), (4)(d), (5)(b), (6)(c), (7)(a), (8)(a), (9)(b), (10)(c), (11)(a), (12)(c), (13)(c), (14)(a), (15)(b), (16)(c), (17)(a), (18)(b), (19)(b), (20)(d), (21)(d), (22)(d), (23)(b), (24)(d), (25)(c), (26)(c), (27)(d), (28)(d), (29)(c), (30)(a), (31)(c), (32)(b), (33)(a), (34)(d), (35)(a), (36)(d), (37)(c), (38)(d), (39)(b), (40)(d), (41)(c), (42)(a), (43)(a), (44)(d), (45)(c), (46)(d), (47)(c), (48)(b), (49)(c), (50)(b)

(c)   Fill in the Blanks:

1   C is a _____level language.
2   The maximum length of a variable in C is _____
3   Enumerated data type is a _____ data type.
4   A declaration float a, b; occupies _____of memory.
5   The _____statement is used to give new names to existing types.
6   The _____ statement is used to alter the normal sequence of program execution by unconditionally transferring control to some other part of the program.

Ans.   (1) (middle), (2) (8), (3) (user defined), (4) (8 bytes), (5) (typedef), (6)(goto)

II   Short Answer Type Questions:

1   What are the functions of an interpreter and compiler?
2   Explain the functions of a linker?
3   'C' is called a middle level language, support the statement.
4   What is the difference between a variable definition and a variable declaration?
5   Give a list of data types available in C.
6   Explain type conversion and its need.
7   Explain the precedence of operators in arithmetic operations.
8   What is the difference between the prefix and postfix forms of the ++ operator, Explain with example?
9   What are the differences between signed and unsigned data types?
10   Give in brief about the difference between division and modular division operators.
11   What are the following and how do they differ: int, long, float and double?
12   What is the void data type?
13   Why must the variable used to hold getchar's return value be of type int?
14   What is the definition of a string in C?
15   Explain constants and volatile variables.
16   What are the definitions of the "Boolean" values true and false in C?
17   What is the difference between a defining instance and an external declaration?
18   To what does the term storage class refer?
19   What is a forward reference?
20   What is the purpose of a static function in a multi-file program?
21   Distinguish between logical and bit wise operators.
22   In arithmetic expressions, to what data type will the C compiler promote a character? Why is a goto statement in decision statements avoided?
23   In a loop, what is the difference between a break and continue statement? What would the equivalent code, using a while loop, be for the example below:

```
for(I = 0; i< 10; I = I + 1)
printf("i is %d\n",i);
```

24   Explain what happens when the following statement is executed?
     If(abs(x)<smin)
     x = (x>0)? xmin : -xmin;
     Is this a compound statement?   Is a compound statement embedded within this statement?
     What is a for(;;)? Explain with an example.
25   Is it possible to use multiple while statements with do statement, justify the answer with an example.
26   Give the general syntax of conditional operator?
27   Which is relational operator?
28   Which are logical Operators?
29   Which are Bitwise Operators?
30   Which are unformatted input output functions?
31   Which are formatted input output functions?
32   What is the use of getchar() function?
33   What is the use of getch() function?
34   What is the use of getche() function?
35   Explain the difference between switch and nested if else with an example?
36   What is the difference between: int * const p; int const * p;
37   What is conditional compilation and where can it be used, explain with examples?
38   State the precautions that can be taken to prevent memory leakage when memory is allocated dynamically in a function. What are the reasons behind the problems encountered?
39   Use of global variables should be avoided but global constants are acceptable, comment?
40   Differentiate between do while and while loop

III   Long Answer Type Questions:

1   Explain about High-level languages.
2   What is a compiler? Differentiate between compiler, interpreter and assembler.
3   What are the different data types available in C, Explain in detail about them?
4   Explain in detail about the various type qualifier and variables declarations in C?
5   Explain in details about the various operators used in C.
6   Explain in detail about expressions with examples
7   What is meant by type casting? Explain in detail with examples.
8   What are the control structures available in C? Discuss each of them with the help of control flow diagram.
9   What are conditions? Where are conditions used? What are the conditional control transfer statements of C? When they are used?
10   What are enumerated data types? How are enumerated data types defined? Do the elements of an enumerated data types have to be specified explicitly in the definition? How an ordering is imposed on the elements of an enumerated data type?
11   Explain in detail about the If statements and Nested If Statements with examples.

12   Give suitable example describing how a switch case works.
13   Explain in detail about the looping structures with examples.
14   How does break and continue effect control transfer in looping structures. Explain with examples.
15   What is the difference between arrays and pointers?
16   How many elements do the array int a [5] contain? Which is the first element and the last one?
17   How can I dynamically allocate a multidimensional array?
18   Since array references decay into pointes, if arr is an array, what's the difference between arr and & arr?
19   Discuss the features of user-defined functions?
20   Clearly differentiate between function prototype, function definition and function call.
21   What do you understand by passing arguments by value, by reference and by Pointer during function invocation? Explain with examples.
22   Explain the different storage classes in C
23   What is the difference between the function static and file static variables? Explain with the help of an example.
24   What are functions? How to pass parameters in functions?
25   Write a program to find minimum and maximum number in an array.
26   Write a function to insert a node in a linked list. The position where insertion takes place and the remaining data required by the function is to be passed as parameters to the function.
27   Write a C program to remove all comments from a file containing C source code. Make sure that comment indicators enclosed within a string literal are not removed.
28   State the problems associated with parameterized macros with examples.
29   Differentiate between structure and an union
30   Write short notes on any two:
        a)   Process Control.
        b)   getc() and putc()
        c)   scanf() and printf()

IV   Practical Questions:
1   Write a program to find all the positive factors of a number.
2   Write a program to find the sum of the first N natural numbers using a for loop.
3   Read an integer and use a menu to find it's square , square root, cube, cube root. Signal all probable errors like square of a negative number, sign of zero etc. Use the menu to exit the program. The menu should use case construct.
4   Write a program to check if a number is a perfect factorial or a Fibonacci number.
5   Write a program to find the prime numbers between two numbers A and B entered by the user. Ensure that the value entered for A is less than that for B.
6   Write a function to perform linear search.
7   Write a Program to find factorial of a number using recursion.
8   Write a Program to using functions to convert a number from one base to another.
9   Implement bubble sort using arrays.
10   Write a program to implement matrix multiplication.
11   Write a program to implement binary search.

12   What is output of the following code and explain it.

```
main()
{
int x=100,y=200;
printf("%",(x>y)?x:y);
}
```

UNIT - II

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   Every variable is associated with an address in memory.
2   The pointer is a special type of variable which holds the value of address of other variable.
3   One type of pointer cannot hold the data with other data type.
4   If we want to change the value of variable passed as an argument to the function inside that function then we should pass the address of the variable.
5   The segment char *a[ ]={"ABC", "def"); is invalid.
6   With pointer, data is manipulated with the address.
7   Arithmetic operations on pointer variables are not possible.
8   A structure is a set of different data type.
9   The dot operator can be used to access the strut variable
10   The structure definition must be terminated by a semi-colon.
11   Structure can be defined inside another structure (nested).
12   The array structure elements cannot be declared.
13   The ptr is a pointer to structure and it can access elements using -> operator.
14   The value of enumerated data type starts from 1.
15   The structure elements are stored in the separate memory locations.
16   The union elements are stored at random memory locations.
17   Union has common storage space for all its variable.
18   Union requires more space as compared to a structure.

Ans. (1)(T), (2)(T), (3)(F), (4)(T), (5)(F), (6)(T), (7)(F), (8)(T), (9)(T), (10)(T), (11)(T), (12)(F), (13)(T), (14)(F), (15)(T), (16)(F), (17)(T), (18)(F)

(b)   Multiple Choice Questions:

1   What will be the output of the following program?

```
#include<stdio.h>]
#include<conio.h>
Void main()
{
int a1[5] = {1};
int b = 0, k = 0;
clrscr();
```

```
for(b =0; b<=4;b++)
{
Printf("%3d",++a1[0]);
}
}
```
(a)   2 3 4 5 6
(b)   1 2 3 4 5
(c)   1 1 1 1 1 1
(d)   1 2 2 2 2 2

2   Every C program consists _____functions(s)
   (a)   Only one
   (b)   Only two
   (c)   one or more
   (d)   none

3   Information will be passed to the function via special identifiers called
   (a)   Arguments
   (b)   Parameters
   (c)   Both a & b
   (d)   None

4   Which of the following function returns a value
   (a)   void f()
   (b)   void f(int a, int b)
   (c)   f()
   (d)   float f(int a)

5   What is the meaning of the following declaration? char f(void)
   (a)   f accepts one argument
   (b)   f accepts no arguments and returns no value
   (c)   f does not accept any argument but returns a single character
   (d)   Both a & b

6   Which of the following is not a storage class in C.?
   (a)   auto
   (b)   struct
   (c)   extern
   (d)   static

7   The storage class of a local variable is
   (a)   auto
   (b)   static
   (c)   extern
   (d)   register

8   Describe the following array int s[5][6]
     (a)   s is a two-dimensional 30 element array(6 rows,5columns)
     (b)   s is a two-dimensional 30 element array(5 rows,6columns)
     (c)   s is a one-dimensional 30 element array(5 rows,6columns)
     (d)   none

9   Write the last element of the following array.Char flag[]="FALSE"
     (a)   E
     (b)   e
     (c)   \0
     (d)   " "

10   What is the output of the following program

     #include<stdio.h>
     int c[10]=[1,2,3,4,5,6,7,8,9,10};
     main()
     { int a,b=0;
     for(a=0;a<10;++a)
     ff(c[a]%2==1) b+=c[a];
     printf('%d",b);
     }

     (a)   20
     (b)   24
     (c)   25
     (d)   30

11   Which of the following is the correct way of passing an array "a" to the function call.
     (a)   f(int a[3])
     (b)   f(a)
     (c)   f(int a)
     (d)   none

12   Declare a pointer to a function that accepts three integer arguments and returns a
      floating-point quantity
     (a)   float f(int a,int b,int c)
     (b)   float (*f)(int a,int b,int c)
     (c)   float f(int *a,int *b,int *c)
     (d)   none

13   Which of the following is not valid where p1,p2 are pointers.
     (a)   p1+3
     (b)   p2-5
     (c)   *p1 + * p2
     (d)   p1 + p2

14 & is _____
   (a)   Binary operator
   (b)   Unary operator
   (c)   Conditional operator
   (d)   Assignment operator

15 Explain the following:
   int (*pf)(char *a, char*b)
   (a)   pf is function that accepts two characters as arguments and returns an integer.
   (b)   pf is pointer to a function that accepts two pointers to characters s arguments and returns an integer.
   (c)   pf is pointer to a function that accepts two characters as arguments and returns an integer.
   (d)   not valid.

16 Declare a function that accepts an argument, which is a pointer to an integer array and returns character.
   (a)   char (*p(int a))[]
   (b)   char (p(int (*a)[])
   (c)   char p(int *a[])
   (d)   none

17 What is the output of this C code?
   ```
   #include <stdio.h>
   int main()
   {
   int c = 2 ^ 3;
   printf("%d\n", c);
   }
   ```
   (a)   1
   (b)   8
   (c)   9
   (d)   0

18 What is the output of this C code?
   ```
   #include <stdio.h>
   int main()
   {
   int a = 2;
   if (a >> 1)
   printf("%d\n", a);
   }
   ```
   (a)   0
   (b)   1
   (c)   2
   (d)   No Output.

19   What is the output of this C code?
```
#include <stdio.h>
void main()
{
int x = 4;
int *p = &x;
int *k = p++;
int r = p - k;
printf("%d", r);
}
```
(a)   4
(b)   8
(c)   1
(d)   Run time error

20   What is the output of this C code?
```
#include <stdio.h>
void main()
{
int a = -5;
int k = (a++, ++a);
printf("%d\n", k);
}
```
(a)   -3
(b)   -5
(c)   4
(d)   Undefined

21   For initialization a = 2, c = 1 the value of a and c after this code will be
c = (c) ? a = 0 : 2;
(a)   a = 0, c = 0;
(b)   a = 2, c = 2;
(c)   a = 2, c = 2;
(d)   a = 1, c = 2;

22   What will be the data type of the expression (a < 50) ? var1 : var2; provided a = int,
var1 = double, var2 = float
(a)   int
(b)   float
(c)   double
(d)   Cannot be determined

23   Which expression has to be present in the following?
exp1 ? exp2 : exp3;
(a)   exp1
(b)   exp2

(c)   exp3
(d).   All of the mentioned

24   Value of c after the following expression (initializations a = 1, b = 2, c = 1):
      c += (-c) ? a : b;
      (a)   Syntax Error
      (b)   c = 1
      (c)   c = 2
      (d)   c = 3

25   Which of the following are incorrect syntax for pointer to structure?
      (Assuming struct temp{int b;}*my_struct;)
      (a)   *my_struct.b = 10;
      (b)   (*my_struct).b = 10;
      (c)   my_struct->b = 10;
      (d)   Both (a) and (b)

26   Which of the following is an incorrect syntax to pass by reference a member of a
      structure in a function?   (Assume: struct temp{int a;}s;)
      (a)   func(&s.a);
      (b)   func(&(s).a);
      (c)   func(&(s.a));
      (d)   None of the mentioned

27   For the following function call which option is not possible?

      func(&s.a); //where s is a variable of type struct and a is the member of the struct.
      (a)   Compiler can access entire structure from the function.
      (b)   Individual member's address can be displayed in structure.
      (c)   Individual member can be passed by reference in a function.
      (d)   Both (b) and (c).

28   What type of data is holded by variable u int this C code?
      #include <stdio.h>
      union u_tag
      {
      int ival;
      float fval;
      char *sval;
      } u;

      The variable u here
      (a)   Will be large enough to hold the largest of the three types;
      (b)   Will be large enough to hold the smallest of the three types;
      (c)   Will be large enough to hold the all of the three types;
      (d)   None of the mentioned

29   Members of a union are accessed as_____.
       (a)   union-name. member
       (b)   union-pointer->member
       (c)   Both a & b
       (d)   None of the mentioned

30   What is the output of this C code?
       #include <stdio.h>
       struct
       {
       char *name;
       union
       {
       char *sval;
       } u;
       } symtab[10];
       the first character of the string sval by either of
       (a)   *symtab[i].u.sval
       (b)   symtab[i].u.sval[0]
       (c)   You cannot have union inside structure
       (d)   Both a & b

31   What will be output if you will compile and execute the following c code?
       #include<stdio.h>
       int main(){
       double far* p,q;
       printf("%d",sizeof(p)+sizeof q);
       return 0;
       }
       (a) 12
       (b) 8
       (c) 4
       (d) 1

32   Can you combine the following two statements into one?
       char *p;
       p = (char*) malloc(100);
       (a)   char p = *malloc(100);
       (b)   char *p = (char) malloc(100);
       (c)   char *p = (char*)malloc(100);
       (d)   char *p = (char *)(malloc*)(100);

33   In which header file is the NULL macro defined?
       (a)   stdio.h
       (b)   stddef.h
       (c)   stdio.h and stddef.h

(d)   math.h

34   How many bytes are occupied by near, far and huge pointers (DOS)?
        (a)   near=2 far=4 huge=4
        (b)   near=4 far=8 huge=8
        (c)   near=2 far=4 huge=8
        (d)   near=4 far=4 huge=8

35   If a variable is a pointer to a structure, then which of the following operator is used to
        access data members of the structure through the pointer variable?
        (a)   .
        (b)   &
        (c)   *
        (d)   ->

36   What would be the equivalent pointer expression for referring the array element
        a[i][j][k][l]
        (a)   ((((a+i)+j)+k)+l)
        (b)   *(*(*(*(a+i)+j)+k)+l)
        (c)   (((a+i)+j)+k+l)
        (d)   ((a+i)+j+k+l)

37   The operator used to get value at address stored in a pointer variable is
        (a)   *
        (b)   &
        (c)   &&
        (d) ||

38   What will be the output of the program?
        #include<stdio.h>
        int main()
        {
            int i=3, *j, k;
            j = &i;
            printf("%d\n", i**j*i+*j);
            return 0;
        }
        (a)   30
        (b)   27
        (c)   9
        (d)   3

39   What will be the output of the program (16-bit platform)?
        #include<stdio.h>
        #include<stdlib.h>
        int main()

```
{
int *p;
p = (int *)malloc(20);
printf("%d\n", sizeof(p));
free(p);
return 0;
}
```
(a)　　4
(b)　　2
(c)　　8
(d)　　Garbage value

40　　Assume integer is 2 bytes wide. How many bytes will be allocated for the following code?
```
#include<stdio.h>
#include<stdlib.h>
#define MAXROW 3
#define MAXCOL 4
int main()
{
int (*p)[MAXCOL];
p = (int (*) [MAXCOL])malloc(MAXROW *sizeof(*p));
return 0;
}
```
(a)　　56 bytes
(b)　　128 bytes
(c)　　24 bytes
(d)　　12 bytes

41　　What is the output of this C code?
```
#include <stdio.h>
int main()
{
 int c = 2 ^ 3;
printf("%d\n", c);
}
```
(a)　　1
(b)　　8
(c)　　9
(d)　　0

42　　What is the output of this C code?
```
#include <stdio.h>
int main()
{
unsigned int a = 10;
```

```
a = ~a;
printf("%d\n", a);
}
```
(a)   -9
(b)   -10
(c)   -11
(d)   10

43   What is the output of this C code?

```
#include <stdio.h>
int main()
{
if (7 & 8)
printf("Honesty");
if ((~7 & 0x000f) == 8)
printf("is the best policy\n");
}
```
(a)   Honesty is the best policy
(b)   Honesty
(c)   is the best policy
(d)   No output

44   What is the output of this C code?
```
#include <stdio.h>
 int main()
{
 int a = 2;
 if (a >> 1)
 printf("%d\n", a);
 }
```
(a)   0
(b)   1
(c)   2
(d)   No Output.

45   Comment on the output of this C code?

```
#include <stdio.h>
 int main()
{
int i, n, a = 4;
scanf("%d", &n);
for (i = 0; i < n; i++)
a = a * 2;
}
```

(a) Logical Shift left
(b) No output
(c) Arithmetic Shift right
(d) bitwise exclusive OR

46   What is the output of this C code?

```
#include <stdio.h>
 void main()
{
 int x = 97;
 int y = sizeof(x++);
 printf("x is %d", x);
}
```
(a) x is 97
(b) x is 98
(c) x is 99
(d) Run time error

47   What is the output of this C code?
```
 #include <stdio.h>
void main()
{
 int x = 4, y, z;
 y = --x;
 z = x--;
 printf("%d%d%d", x, y, z);
}
```
(a) 3 2 3
(b) 2 2 3
(c) 3 2 2
(d) 2 3 3

48   What is the output of this C code?
```
#include <stdio.h>
void main()
{
 int x = 4;
int *p = &x;
int *k = p++;
int r = p - k;
printf("%d", r);
}
```
(a) 4
(b) 8
(c) 1

(d)   Run time error

49   What is the output of this C code?
      #include <stdio.h>
      void main()
      {
       int a = 5, b = -7, c = 0, d;
      d = ++a && ++b || ++c;
       printf("\n%d%d%d%d", a, b, c, d);
      }
      (a)   6 -6 0 0
      (b)   6 -5 0 1
      (c)   -6 -6 0 1
      (d)   6 -6 0 1

50   What is the output of this C code?
      #include <stdio.h>
      void main()
      {
      int a = -5;
      int k = (a++, ++a);
      printf("%d\n", k);
      }
      (a)   -3
      (b)   -5
      (c)   4
      (d)   Undefined

Ans. (1)(a), (2)(c), (3)(c), (4)(d), (5)(c), (6)(b), (7)(a),(8)(b), (9)(c), (10)(a), (11)(b), (12)(b),
      (13)(d), (14)(b), (15)(b), (16)(b), (17)(a), (18)(c), (19)(c), (20)(a), (21)(a), (22)(c),
      (23)(d), (24)(c), (25)(a), (26)(d), (27)(a), (28)(a), (29)(c), (30)(d), (31)(a), (32)(c),
      (33)(c), (34)(a), (35)(d), (36)(b), (37)(a), (38)(a), (39)(b), (40)(c), (41)(a), (42)(c),
      (43)(c), (44)(c), (45)(b), (46)(a), (47)(d), (48)(c), (49)(d), (50)(a)

(c)   Fill in the Blanks:

1   The_____ parameters are specified in the function call
2   _____ is the "token-pasting"operator.
3   The C pre-processor is a collection of statements, called _____
4   # define statement can be used for _____ and _____.
5   Multiline macros can be defined by placing _____at the end of each line except the
      last.
6   #undef directive "undefines"_____and _____.

Ans. (1)(actual), (2)(#), (3)(Directives), (4) (define symbolic statements and macros),
      (5)(\), (6)(symbolic constant and macro identifier)

II   Short Answer Type Questions:

1   Explain the different types of user-defined functions.
2   Discuss the features of recursion with examples.
3   Explain the difference between the address operator and bitwise operator.
4   Discuss the features of one-dimensional and two-dimensional arrays.
5   Write short notes on functions and arrays.
6   What is an index? Why does it have to be unique?
7   What is special about void pointers?
8   Discus the features of pointers.
9   How can I dynamically allocate Multidimensional array.
10   Discuss about pointers and functions.
11   Write short notes on array of pointers.
12   Write how the pointers are associated with arrays.
13   Difference between macros and functions.
14   Discuss the features of pre-processor directives.
15   What do you understand by scope and extent of an identifier?
16   Differentiate between auto &static storage class.
17   Differentiate between static memory allocation & dynamic memory allocation.
18   Differentiate between near & far pointer.
19   What is the difference between exit and abort?
19   Explain # and ## preprocessor operations.
20   Differentiate between variables and constants.
21   Differentiate between malloc() and calloc()

III   Long Answer Type Questions:

1   What do you understand by pointer to a pointer? Can this be extended to any   level? Verify.
2   Explain the difference between malloc(), calloc() and realloc().
3   What is dynamic memory allocation? Discuss various library functions for it.
4   What are macros? Discuss its various types with the help of examples.
5   What is conditional compilation? Explain in detail.
6   Difference between pointers and arrays.
7   Discuss the important features of structures.
8   Write how to process the structure.
9   What is the purpose of *typedef* feature?
10   Write short notes on self-referential structures.
11   Discuss about pointers and structures.
12   An application stores points using rectangular / polar coordinates. Define a union that can support these two formats for storing a point. Write functions to:
         a. Convert from polar to rectangular storage.
         b. Calculate the distance between two points
13   Define type casting. Explain using an example.
14   Differentiate between recursion & iteration. Explain using an example. Which can be solved by both methods?

15   Declare an array of pointers and allocate memory to each of its elements. How would you release the allocated memory?

16   Explain function callback with the help of an example.

17   Write any four string handling functions with examples.

18   Write a program that reads a file and counts the characters, spaces, tabs and new lines in the file.

IV   Practical Questions:

1   Construct a program using structures for managing the membership of a library.
        There are 2 kinds of members who can borrow
        (a)   2 books at a time, for 2 days
        (b)   4 books at a time for 4 days

2   Write a program that accepts the name, code number and duration of the books borrowed and, displays the names and other information of all those members having dues.

3   Write a program to process student records by using structures. Also use array of structures.

4   Write a program to process employee records by using unions.

5   Write a function that accepts characters into a string by using a pointer. Compute the length of the array using a pointer, given that the string is terminated by a null character. Finally print the string in reverse order using a pointer.

6   Write a program that consists of two files sum.c and main.c. The file sum.c has a function that takes two integer arguments and stores the result in a global shared variable called sum. Accept the two inputs in main.c, call the function sum.c and print the result in main.c.

UNIT - III

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   The preprocessor is a program that processes the source code before compilation.
2   The program typed in the editor is the source code for the preprocessor.
3   The #define defines the macro templates.
4   The #undef undefines the macro.
5   With #include "stdio.h" the compiler searches the file in the entire system.
6   With #include <stdio.h> the compiler searches the file in the standard directory.
7   Conditional compilation means a few statements can be skipped from a compiler.
8   The #ifdef and #ifndef work exactly in the same manner.
9   The #error flags are user-defined messages.
10   The #pragma sets off/on warning and error messages.
11   Does there any function exist to convert the int or float to a string?
12   strrchr() standard library function will you use to find the last occurance of a character in a string in C.

13   The purpose of fflush() function is to flushes only specified stream.
14   The fprintf() to display the output on the screen.
15   The function randomize() will returns a random number generator with a random value based on time in Turbo C under DOS.

Ans.   (1)(T), (2)(T), (3)(T), (4)(T), (5)(F), (6)(T), (7)(T), (8)(F), (9)(T), (10)(T), (11)(T), (12)(T), (13)F), (14)(T), (15)(T)

(b)   Multiple Choice Questions:

1   What is the return value of the following statement?
     Strcmp ("amp","bcd");
     (a)   1
     (b)   0
     (c)   2
     (d)   -1

2   _____Function is used to concatenate two strings
     (a)   strcat
     (b)   strcot
     (c)   strconcat
     (d)   none

3   What is the output of the following code.
     main()
     {
     char*s="abcd";
     printf("%s",s);}

     (a)   a
     (b)   b
     (c)   error
     (d)   abcd

4   _____operator is used to access structure members
     (a)   &
     (b)   *
     (c)   .
     (d)   +

5   What is the meaning of self-referential structure?
     (a)   Array of structures
     (b)   Single structure
     (c)   Structure calling it's parent structure
     (d)   Structure calling another structure

6   Which of the following is equivalent to customer.name[2]
     (pc is a pointer to structure)

(a)   *(customer.name+2)
(b)   (*pc).name[2]
(c)   pc->name[2]
(d)   above all

7   How many union members can be initialized?
(a)   Only one member of a union at any one time.
(b)   any number of members of a union at one time.
(c)   Union members can not be initialized.
(d)   None

8   The associativity of period (.) operator is ___a_____
(a)   left-to-right
(b)   right-to-left
(c)   No associatively
(d)   None

9   A data file must be _____before it can be created or processed.
(a)   Closed
(b)   Read
(c)   Opened
(d)   Above all

10   FILE is _____
(a)   Stack
(b)   Pointer
(c)   Union
(d)   Structure

11   The *fopen* function returns a pointer _____associated with the file.
(a)   to the beginning of the buffer area
(b)   to the closing to the buffer area
(c)   NULL
(d)   none

12   Which of the following functions are used in unformatted data file.
(a)   fscanf
(b)   fwrite
(c)   fread
(d)   b&c

13   Which of the following declaration is correct.
(a)   fopen("c:\a.txt","w");
(b)   pt=fopen("c:\a.txt","w");
(c)   fopen("c:\a.txt","w")=fp;
(d)   none

14   Strcat function adds null character
      (a)   Only if there is space
      (b)   Always
      (c)   Depends on the standard
      (d)   Depends on the compiler

15   What is the default return-type of getchar()?
      (a)   char
      (b)   int
      (c)   char *
      (d)   Reading character doesn't require a return-type

16   The value of EOF is_____.
      (a)   -1
      (b)   0
      (c)   1
      (d)   10

17   What does this statement printf("%10s", state); mean?
      (a)   10 spaces before the string state is printed
      (b)   Print empty spaces if the string state is less than 10 characters
      (c)   Print the last 10 characters of the string
      (d)   None of the mentioned

18   Which of the following function sets first n characters of a string to a given character?
      (a)   strinit()
      (b)   strnset()
      (c)   strset()
      (d)   strcset()

19   What will the function rewind () do?
      (a)   Reposition the file pointer to a character reverse.
      (b)   Reposition the file pointer stream to end of file.
      (c)   Reposition the file pointer to begining of that line.
      (d)   Reposition the file pointer to begining of file.

20   Input/output function prototypes and macros are defined in which header file?
      (a)   conio.h
      (b)   stdlib.h
      (c)   stdio.h
      (d)   dos.h

21   Which standard library function will you use to find the last occurance of a character in a string in C?
      (a)   strnchar()
      (b)   strchar()

(c)   strrchar()
(d)   strrchr()

22   What is stderr ?
(a)   Standard error
(b)   Standard error types
(c)   Standard error streams
(d)   Standard error definitions

23   Does there any function exist to convert the int or float to a string?
(a)   Yes
(b)   No

24   Which of the following function is used to find the first occurrence of a given string in another string?
(a)   strchr()
(b)   strrchr()
(c)   strstr()
(d)   strnset()

25   Which mathematical function among the following does NOT require int parameters?
(a)   div(x, y);
(b)   srand(x);
(c)   sqrt(x);
(d)   All of the mentioned.

26   sin(x) returns
(a)   sine of x where x is in radians
(b)   sine of x where x is in degree
(c)   cosine of x where x is in radians
(d)   cosine of x where x is in degree

27   cos(x) returns
(a)   sine of x where x is in radians
(b)   sine of x where x is in degree
(c)   cosine of x where x is in radians
(d)   cosine of x where x is in degree

28   Which among the following mathematical function do not have a "double" return-type?
(a)   srand(x);
(b)   ceil(x);
(c)   floor(x);
(d)   Both (b) and (c);

29   function fabs defined math.h header file takes argument of type integer.
(a)   true

(b)   false
(c)   Depends on the implementation
(d)   Depends on the standard

30   Which of the following is not a valid mathematical function?
(a)   frexp(x);
(b)   atan2(x,y);
(c)   srand(x);
(d)   fmod(x);

31   What will be output if you will compile and execute the following c code?
```
#include<stdio.h>
#define max 5;
int main(){
int i=0;
i=max++;
printf("%d",i++);
return 0;
}
```
(a)   5
(b)   6
(c)   7
(d)   0

32   If the two strings are identical, then strcmp() function returns
(a)   -1
(b)   1
(c)   0
(d)   Yes

33   The library function used to find the last occurrence of a character in a string is
(a)   strnstr()
(b)   laststr()
(c)   strrchr()
(d)   strstr()

34   What will be the output of the program ?
```
#include<stdio.h>
#include<string.h>
int main()
{
printf("%d\n", strlen("123456"));
return 0;
}
```
(a)   6
(b)   12

(c)   7
(d)   2

35   What is stderr?
       (a)   standard error
       (b)   standard error types
       (c)   standard error streams
       (d)   standard error definitions

36   What is the purpose of fflush() function.
       (a)   flushes all streams and specified streams.
       (b)   flushes only specified stream.
       (c)   flushes input/output buffer.
       (d)   flushes file buffer.

37   What will the function randomize() do in Turbo C under DOS?
       (a)   returns a random number.
       (b)   returns a random number generator in the specified range.
       (c)   returns a random number generator with a random value based on time.
       (d)   return a random number with a given seed value.

38   What will be the output of the program?
       ```
       #include<stdio.h>
       #define SQR(x)(x*x)
       int main()
       {
        int a, b=3;
       a = SQR(b+2);
       printf("%d\n", a);
       return 0;
       }
       ```
       (a)   25
       (b)   11
       (c)   Error
       (d)   Garbage value

39   What will be the output of the program?
       ```
       #include<stdio.h>
       #define CUBE(x) (x*x*x)
       int main()
       {
       int a, b=3;
       a = CUBE(b++);
       printf("%d, %d\n", a, b);
       return 0;
       }
       ```

(a)   9, 4
(b)   27, 4
(c)   27, 6
(d)   Error

40   What will be the output of the program?
```
#include<stdio.h>
#define SWAP(a, b) int t; t=a, a=b, b=t;
int main()
{
int a=10, b=12;
SWAP(a, b);
printf("a = %d, b = %d\n", a, b);
return 0;
}
```
(a)   a = 10, b = 12
(b)   a = 12, b = 10
(c)   Error: Declaration not allowed in macro
(d)   Error: Undefined symbol 't'

41   What is the default return-type of getchar()?
(a)   char
(b)   int
(c)   char *
(d)   Reading character doesn't require a return-type

42   What is the use of getchar()?
(a)   The next input character each time it is called
(b)   EOF when it encounters end of file.
(c)   Both a & b
(d)   None of the mentioned

43   Which is true?
(a)   The symbolic constant EOF is defined in
(b)   The value is typically -1,
(c)   Both a & b
(d)   Either a or b

44   What is the use of putchar()?
(a)   The character written
(b)   EOF is an error occurs
(c)   Nothing
(d)   Both a & b

45   What is the output of this C code?
```
#include <stdio.h>
```

```
int main()
{
 char c = '�';
putchar(c);
}
```
(a)   Compile time error
(b)   Nothing
(c)   0
(d)   Undefined behaviour

46   putchar(c) function/macro always outputs character c to the
       (a)   screen
       (b)   standard output
       (c)   depends on the compiler
       (d)   Depends on the standard

47   What is the output of this C code if
       following commands are used to run(considering myfile exists)?
       gcc -otest test.c
       ./test < myfile
```
#include <stdio.h>
int main()
{
char c = 'd';
putchar(c);
}
```
       (a)   Compile time error (after first command)
       (b)   d in the myfile file
       (c)   d on the screen
       (d)   Undefined behaviour

48   What is the output of this C code if
       following commands are used to run(considering myfile exists)?
       gcc -otest test.c
       ./test > myfile
```
 #include <stdio.h>
 int main(int argc, char **argv)
{
char c = 'd';
putchar(c);
printf(" %d\n", argc);
}
```
       (a)   d 2 in myfile
       (b)   d 1 in myfile
       (c)   d in myfile and 1 in screen
       (d)   d in myfile and 2 in screen

49 What is the output of this C code if
following commands are used to run and if myfile does not exist?
gcc -o test test.c
./test > myfile
```c
#include <stdio.h>
int main(int argc, char **argv)
{
char c = 'd';
putchar(c);
printf(" %d\n", argc);
}
```
(a) d 2 in myfile
(b) d 1 in myfile
(c) Depends on the system
(d) Depends on the standard

50 The statement prog <infile causes
(a) prog to read characters from infile.
(b) prog to write characters to infile.
(c) infile to read characters from prog instead.
(d) Nothing

Ans. (1)(d), (2)(a), (3)(d), (4)(c), (5)(c), (6)(d), (7)(a), (8)(a), (9)(c), (10)(d), (11)(a), (12)(d), (13)(b), (14)(b), (15)(b), (16)(a), (17)(b), (18)(b), (19)(d), (20)(c), (21)(d), (22)(c), (23)(a), (24)(c), (25)(c), (26)(a), (27)(c), (28)(a), (29)(b), (30)(d), (31)(d), (32)(c), (33)(c), (34)(a), (35)(c), (36)(a), (37)(c), (38)(b), (39)(c), (40)(b), (41)(b), (42)(c), (43)(c), (44)(d), (45)(b), (46)(b), (47)(c), (48)(b), (49)(b), (50)(a)

(c)   Fill in the Blanks:

1 The file must be opened in _____mode to add the new information at the end of the file.
2 fopen function contains_____number of arguments.
3 The_____operator is used to access the members of a structure.
4 All variables inside a _____share storage space.
5 The _____ function copies one string to another.
6 The strcmp() returns _____ if both strings are identical.
7 The _____ function sets the file pointer associated with a stream to a new position.

Ans. (1)(append), (2)(2), (3)(dot), (4)(union), (5)(strcpy), (6) (0), (7) (fseek)

II   Short Answer Type Questions:

1 Describe the different ways in which data files can be categorized in C?
2 Write short notes on the following data file functions

       i.   fscanf
       ii.   fprintf

3   Describe the different I/O operations on files.
4   Discuss the important features of unformatted data files.
5   Write short notes on command line arguments.
6   Write about random access to files.
7   Write briefly about declaring and initializing string variables.
8   What is a field of a structure?
9   Explain the difference between the two member access operators: . and ->
10   What is a file? Why a file is called an external data structure?
11   Discuss some library functions from math.h.
12   How would you find size of a file using fseek and ftell?
13   How would you make a parent process suspend its execution until a child process terminates? How does the parent get to know which child process terminated?
14   What is the difference between file open modes r+ and w+?
15   What is memory leakage? Give an example statement that can cause memory leakage and explain it with the help of a diagram.
16   How are system calls different from library functions? Explain.
17   Define GCC utility. Why do we use it? Explain using an example.

III   Long Answer Type Questions:

1   Discuss the differences between a text file and a binary file.
2   How do we check for errors upon opening a file and output the correct error message?
3   Discuss various file handling functions with examples.
4   Differentiate between a structure and union.
5   How are arrays of structures defined? Explain with an example.
6   What are bit fields? How are they useful>
7   Discuss the various library functions of String.h with examples.
8   Write a note on stdlib.h and process.h.
9   What are nested structures and how are they defined? Give examples.
10   How is structure different from an array? Give examples.
11.   Write macro definitions with arguments for calculation of Simple Interest and Amount. Store these macro definitions in a file called "interest.h". Include this file in your program, and use the macro definitions for calculating simple interest and amount.
12.   Write a program to sort a set of names stored in an array in alphabetical order.
13.   Write a program to combine contents of multiple text files in a target file. The names of the files must be accepted as command line parameters. Remember to include appropriate checks.
14.   Explain how you would use the library function bsearch to find a student structure in an array of student structures.
15.   Use functions to perform the following operations on a text file:
a. Count the number of words in a file
b. Copy a file to another

IV   Practical Questions:

1   Write a program to convert the case of alphabets in a text file. Uppercase letters should be converted to lower case and vice versa.
2   Write a program to store the data of students-name, register number and marks for 6 subjects. Display the data stored. Use a menu to enter the choice from the user to create a new data file or read the contents of previously created file.
3   Define a preprocessor macro swap(t, x, y) that will swap two arguments x and y of a given   type t.
4   Define a preprocessor macro to select:
   • the least significant bit from an unsigned char
   • the *n*th (assuming least significant is 0) bit from an unsigned char.
5   Write a program that simulates throwing a six sided die
6   Write a program to compare two files and print out the lines where they differ. Hint: look up appropriate string and file handling library routines. This should not be a very long program

UNIT – IV

I   Test Your Skills:

(a)   Multiple Choice Questions:

1   You have a new application on a CD-ROM that you wish to install. What should your first step be?
    Choose one:
    (a)   Read the installation instructions on the CD-ROM.
    (b)   Use the mount command to mount your CD-ROM as read-write.
    (c)   Use the unmount command to access your CD-ROM.
    (d)   Use the mount command to mount your CD-ROM as read-only.

2   You are covering for another system administrator and one of the users asks you to restore a file for him. You locate the correct tarfile by checking the backup log but do not know how the directory structure was stored. What command can you use to determine this?
    Choose one:
    (a)   tar fx tarfile dirname
    (b)   tar tvf tarfile filename
    (c)   tar ctf tarfile
    (d)   tar tvf tarfile

3   You have the /var directory on its own partition. You have run out of space. What should you do? Choose one:
    (a)   Reconfigure your system to not write to the log files.
    (b)   Use fips to enlarge the partition.

(c)   Delete all the log files.
(d)   Delete the partition and recreate it with a larger size.

4   If you type the command cat dog &> cat what would you see on your display? Choose one:
(a)   Any error messages only.
(b)   The contents of the file dog.
(c)   The contents of the file dog and any error messages.
(d)   Nothing as all output is saved to the file cat.

5   To scan a and b given below, which of the following scanf() statement will you use?
#include<stdio.h>
float a;
double b;

(a)   scanf("%f %f", &a, &b);
(b)   scanf("%Lf %Lf", &a, &b);
(c)   scanf("%f %Lf", &a, &b);
(d)   scanf("%f %lf", &a, &b);

6   Consider the following program. What will be content of t?
#include<stdio.h>
int main()
{
FILE *fp;
int t;
fp = fopen("DUMMY.C", "w");
t = fileno(fp);
printf("%d\n", t);
return 0;
}
(a)   size of "DUMMY.C" file
(b)   The handle associated with "DUMMY.C" file
(c)   Garbage value
(d)   Error in fileno()

7   How will you free the allocated memory?
(a)   remove(var-name);
(b)   free(var-name);
(c)   delete(var-name);
(d)   dalloc(var-name);

8   The first and second arguments of fopen are
(a)   A character string containing the name of the file & the second argument is the mode.

(b)   A character string containing the name of the user & the second argument is the mode.

(c)   A character string containing file poniter & the second argument is the mode.

(d)   None of the mentioned of the mentioned

9   If there is any error while opening a file, fopen will return
(a)   Nothing
(b)   EOF
(c)   NULL
(d)   Depends on compiler

10   Which is true about getc? getc returns:
(a)   The next character from the stream referred to by file pointer
(b)   EOF for end of file or error
(c)   Both a & b
(d)   Nothing.

11   When a C program is started, O.S environment is responsible for opening file and providing pointer for that file?
(a)   Standard input
(b)   Standard output
(c)   Standard error
(d)   All of the mentioned

12   FILE is of type _____ ?
(a)   int type
(b)   char * type
(c)   struct type
(d)   None of the mentioned

13   What is the meant by 'a' in the following operation?
    fp = fopen("Random.txt", "a");
(a)   Attach
(b)   Append
(c)   Apprehend
(d)   Add

14   Which type of files can't be opened using fopen()?
(a)   .txt
(b)   .bin
(c)   .c
(d)   None of the mentioned

15   Which of the following mode argument is used to truncate?
(a)   a
(b)   f

(c)   w

(d)   t

16   Which of the following fopen statements are illegal?
(a)   fp = fopen("abc.txt", "r");
(b)   fp = fopen("/home/user1/abc.txt", "w");
(c)   fp = fopen("abc", "w");
(d)   None of the mentioned

17   What does the following segment of code do?
fprintf(fp, "Copying!");
(a)   It writes "Copying!" into the file pointed by fp
(b)   It reads "Copying!" from the file and prints on display
(c)   It writes as well as reads "Copying!" to and from the file and prints it
(d)   None of the mentioned

18   FILE reserved word is
(a)   A structure tag declared in stdio.h
(b)   One of the basic datatypes in c
(c)   Pointer to the structure defined in stdio.h
(d)   It is a type name defined in stdio.h

19   Which of the following statements about stdout and stderr are true?
(a)   Same
(b)   Both connected to screen always.
(c)   Both connected to screen by default.
(d)   stdout is line buffered but stderr is unbuffered.

20   What is the output of this C code?
#include <stdio.h>
int main()
{
FILE *fp = stdout;
int n;
fprintf(fp, "%d ", 45);
fflush(stdout);
fprintf(stderr, "%d", 65);
return 0;
}
(a)   45 65
(b)   65 45
(c)   45
(d)   Compilation error

21   What function should be used to free the memory allocated by calloc() ?
(a)   dealloc();

(b)   malloc(variable_name, 0)
(c)   free();
(d)   memalloc(variable_name, 0)

22   What is the size of array "line" used in fgets(line, maxline, *fp) function?
(a)   maxline – 1
(b)   maxline
(c)   maxline + 1
(d)   Size is dynamic

23   The function int fputs(char *line, FILE *fp) returns EOF when:
(a)   '�' character of array line is encountered
(b)   'n' character in array line is encountered
(c)   't' character in array line is encountered
(d)   When an error occurs

24   Which function has a return type as char pointer?
(a)   getline
(b)   fputs
(c)   fgets
(d)   All of the mentioned

25   Which of the following is the right declaration for fgets inside the library?
(a)   int *fgets(char *line, int maxline, FILE *fp);
(b).   char *fgets(char *line, int maxline, FILE *fp);
(c)   char *fgets(char *line, FILE *fp);
(d)   int *fgets(char *line, FILE *fp);

26   calloc initialises memory with all bits set to zero.
(a)   true
(b)   false
(c)   Depends on the compiler
(d)   Depends on the standard

27   realloc(ptr, size), where size is zero means
(a)   Allocate a memory location with zero length
(b)   Free the memory pointed to by ptr
(c)   Undefined behaviour
(d)   Doesn't do any reallocation of ptr i.e. no operation

28   calloc() returns a storage that is initialized to.
(a)   Zero
(b)   Null
(c)   Nothing
(d)   One

29   Why do we write (int *) before malloc?
      int *ip = (int *)malloc(sizeof(int));

      (a)   It is for the syntax correctness
      (b)   It is for the type-casting
      (c)   It is to inform malloc function about the data-type expected
      (d)   None of the mentioned

30   What is the output of this C code?
      ```
      #include <stdio.h>
      union u
      {
      struct
      {
      unsigned char x : 2;
      unsigned int y : 2;
      }p;
      int x;
      };
      int main()
      {
      union u u.p.x = 2;
      printf("%d\n", u.p.x);
      }
      ```
      (a)   Compile time error
      (b)   2
      (c)   Depends on the compiler
      (d)   Depends on the standard

31   What is mean by inverted file?
      (a)   A file which stores opposite records
      (b)   Locates information about data in small files that are maintained apart from
              actual data record
      (c)   A file which stores information about records of a system
      (d)   None of above

32   The following program:
      ```
      main()
      {
      if(fork()>0)
      sleep(100);
      }
      ```
      results in the creation of:
      (a)   an orphan process
      (b)   a zombie process
      (c)   a process that executes forever

(d)   None of these

33   The following C program:
      main()
      {
      fork();fork();printf("yes");
      }
      prints yes:
      (a)   only once
      (b)   twice
      (c)   four times
      (d)   eight times

34   Which of the following calls never returns an error ?
      (a)   getpid
      (b)   fork
      (c)   ioctl
      (d)   open

35   The child process completes execution,but the parent keeps executing, then the child process is known as
      (a)   Orphan
      (b)   Zombie
      (c)   Body
      (d)   Dead

36   Which of the following commands can be used to change default permissions for files and directories at the time of creation.
      (a)   Chmod
      (b)   Chown
      (c)   Umask
      (d)   Chgrp

37.   The Octal number to be given along with chmod command to make a file readable, writable and executable to the owner, readable and executable to group and others is:
      (a)   000
      (b)   755
      (c)   744
      (d)   555

38.   The chmod ugo+rw note command can be represented in octal notation as
      (a)   chmod 555 note
      (b)   chmod 666 note
      (c)   chmod 444 note
      (d)   chmod 333 note

39.   Which one of following provides conceptual support for function call?

(a)   The system stack
(b)   The processors registers
(c)   The data segment
(d)   The text segment

40.   Which one of the following is not shared by threads?
(a)   program counter
(b)   stack
(c)   both (a) and (b)
(d)   none of the mentioned

41   If there is any error while opening a file, fopen will return
(a)   Nothing
(b)   EOF
(c)   NULL
(d)   Depends on compiler

42   Which is true about getc.getc returns?
(a)   The next character from the stream referred to by file pointer
(b)   EOF for end of file or error
(c)   Both a & b
(d)   Nothing.

43   When a C program is started, O.S environment is responsible for opening file and providing   pointer for that file?
(a)   Standard input
(b)   Standard output
(c)   Standard error
(d)   All of the menitoned

44   What is the meant by 'a' in the following operation?
fp = fopen("Random.txt", "a");
(a)   Attach
(b)   Append
(c)   Apprehend
(d)   Add

45   Which of the following mode argument is used to truncate?
(a)   a
(b)   f
(c)   w
(d)   t

46   Which type of files can't be opened using fopen()?
(a)   .txt
(b)   .bin

(c)   .c
(d)   None of the mentioned

47   What is the output of this C code if there is no error in stream fp?
```
#include <stdio.h>
int main()
{
FILE *fp;
fp = fopen("newfile", "w");
printf("%d\n", ferror(fp));
return 0;
}
```
(a)   Compilation error
(b)   0
(c)   1
(d)   Any nonzero value

48   Within main, return expr statement is equivalent to.
(a)   abort(expr)
(b)   exit(expr)
(c)   ferror(expr)
(d)   None of the mentioned

49   What is the output of this C code?
```
#include <stdio.h>
int main()
{
FILE *fp;
char c;
int n = 0;
fp = fopen("newfile1.txt", "r");
while (!feof(fp))
{
c = getc(fp);
putc(c, stdout);
}
}
```
(a)   Compilation error
(b)   Prints to the screen content of newfile1.txt completely
(c)   Prints to the screen some contents of newfile1.txt
(d)   None of the mentioned

50   What is the output of this C code?
```
#include <stdio.h>
int main()
{
FILE *fp = stdout;
```

```
stderr = fp;
fprintf(stderr, "%s", "hello");
}
```
(a)   Compilation error
(b)   hello
(c)   Undefined behaviour
(d)   Depends on the standard

Ans.   (1)(d), (2)(d), (3)(d), (4)(d), (5)(d), (6)(b),(7)(b), (8)(a), (9)(c), (10)(c), (11)(d), (12)(c),
       (13)(b), (14)(d), (15)(c), (16)(d), (17)(a), (18)(d), (19)(c), (20)(a), (21)(c), (22)(b),
       (23)(d), (24)(c), (25)(b) , (26)(a), (27)(b), (28)(a), (29)(b), (30)(a), (31)(b), (32)(b),
       (33)(c), (34)(a), (35)(b), (36)(c), (37)(b), (38)(b), (39)(a), (40)(c), (41)(c), (42)(c),
       (43)(d), (44)(b), (45)(c), (46)(d), (47)(b), (48)(b), (49)(d), (50)(b)

(b)   Fill in the Blanks:

1   ………………is a command which is typed at a command line to determine which
       shell you are using.
2   ………………… command turns a single process into 2 identical processes.
3   Many standard library calls have errors defined in the ………………… header file.
4   ……………….. is a special system variable that is set if a system call cannot perform
       its set task.

Ans.   (1)(echo $SHELL), (2)(fork()), (3)(sys/stat.h), (4)(errno)

II   Short Answer Type Questions:

1   What is 'inode'?
2   Brief about the directory representation in LINUX]
3   What are the LINUX system calls for I/O?
4   How do you change File Access Permissions?
5   What is a FIFO?
6   Explain fork() system call.
7   List the system calls used for process management.
8   What are the process states in Unix?
9   Explain what happens when a new thread is created?
10   Explain why mutex locks are important in threading?
11.   If a program contains four calls to fork( ) one after the other how many total processes
        would get created?
12.   What is the difference between a zombie process and an orphan process?
13.   What purpose do the functions getpid( ), getppid( ), getpppid( ) serve?
14.   What are the differences between process and thread?
15.   Write a simple C program to demonstrate use of pthread basic functions

III   Long Answer Type Questions:

1   Explain how commands can be executed without invoking new process.

2   Explain any TEN built in functions with example.

3   Explain the structure of a Directory with inodes.

4   How will you set permissions for Owner, Group and Public?

5   Explain the file system hierarchy in LINUX System.

6   Explain what happens when a thread attempts to lock a mutex.

7   Explain two ways threads can deadlock.

8   Define 'Make' utility. What is the scope & used of make file. Explain using an example.

9.   Define the following commands
     (a)   Fork()
     (b)   Wait()
     (c)   Exec()

10.   Write a program to copy the file contents into another file.

11.   Write a program to demonstrate thread creation. The thread created should simply print a fixed message as many times as required by the main program (pass data to the thread).

12.   Write a program that displays the contents of the directory (using system) that is passed as command line parameter. The program should then display a menu providing options to copy, move or delete the file. The desired operation should be carried through a child   process whose memory area is overlaid with the required shell command.

13   Define file accessibility and directories regarding LINUX into C.

QUESTION BANK

DISCRETE MATHEMATICS

MCA 105

QUESTION BANK
DISCRETE MATHEMATICS – MCA 105
MCA I

UNIT - I

I Test Your Skills:

(a) State Whether the Following Statements are True or False:

1 Ø∈{Ø}
2 Ø∈{ Ø,{Ø}}
3 {Ø} ∈{Ø}
4 {Ø} ∈{{ Ø}}
5 Ø ∈{x}
6 If A∩B=B then B is properly contained in set B.
7 If R is an equivalence relation on a set A, the R^{-1} is also an equivalence relation.
8 Let X be a finite set with 100 elements and Y be a finite set with 2 elements. Then a function f : X → Y can be an injection
9 Let A, B, C be three finite nonempty subsets of R. Then (A ∪ B) ∩ C and (A ∩ B) ∪ C can have the same size.
10 Let X, Y be nonempty subsets of R and consider the function f : X → Y , f(x) = x^2 . Then f can be a bijection.
11 Let X be a nonempty subset of N. Then a function f : X → X can be a surjection.
12 Let f : N → N and let A, B be finite subsets of N of 100 elements each. Then it is possible for f(A ∪ B) to have 2 elements while f(A) ∪ f(B) has 3 elements.
13 The number of sequences of bits such that four of the bits are 0, three of the bits are 1, and are such that they start with a 1 and end with two 0's is 16.
14 Let X be a set with 2 elements and Y be a set with 3 elements. There are as many functional binary relations with domain X and codomain Y as there are functions with domain X and codomain Y.
15 The function f : N → N f(x) = 2x − 1 is a bijection.

Ans. (1)(T), (2)(T), (3)(F), (4)(T), (5)(F), (6)(T), (7)(F), (8)(F), (9)(T), (10)(T), (11)(T), (12)(F), (13)(F), (14)(F), (15)(F)

(b) Multiple Choice Questions:

1 The bit strings for the sets{1,2,3,4,5} and {1,3,5,7,9} are 11 1110 0000 and 10 1010 1010, respectively. Use bit strings to find the union and intersection of these sets.
   (a) {1,3,5}
   (b) {1,2,5}
   (c) {4,7,9}
   (d) {2,3,5}

2 A student is to answer 10 out of 13 questions in an exam. How many choices have he?
 (a) 256
 (b) 286
 (c) 156
 (d) 234

3 A sample of 80 car owners revealed that 24 owned station wagons and 62 owned cars which are not station wagons. Find the number k people who owned both station wagon and some other car.
 (a) 7
 (b) 4
 (c) 6
 (d) 8

4 Consider the relation | of division on the N of positive integers. Check whether the relation is
 (a) Reflexive
 (b) Symmetric
 (c) Antisymmetric
 (d) Transitive.
 (e) Both a) and d).

5 Find the number n of four-letter words that can be formed from the word NUMERICAL
 (a) 3024.
 (b) 840.
 (c) 1344.
 (d) 504.

6 Find n if (a) P(n,2)=72, and (b)P(n,4)=42 P(n,2).
 (a) 10
 (b) 9
 (c) 8
 (d) 5

7 A students can take one of four mathematics sections and one of five English sections. Find the number n of ways he can register for the two courses.
 (a) 24.
 (b) 28.
 (c) 20.
 (d) 18

8 Which of the following statements is FALSE?
 (a) $2 \in A \cup B$ implies that if $2 \in -A$ then $2 \in B$
   (b)$\{2,3\} \subseteq A$ implies that $2 \in A$ and $3 \in A$.

$(c)\ A \cap B \supseteq \{2,3\}\ implies\ that\ \{2,3\} \subseteq A\ and\ \{2,3\} \subseteq B.$
$(d)A - B \supseteq \{3\}and\ \{2\} \subseteq B\ implies\ that\ \{2,3\} \subseteq A \cup B.$
$(e)\ \{2\} \in A\ and\ \{3\} \in A\ implies\ that\ \{2,3\} \subseteq A.$

9 Let A = {0, 1} × {0, 1} and B = {a, b, c}. Suppose A is listed in lexicographic order based on 0 < 1 and B is in alphabetic order. If A × B × A is listed in lexicographic order, then the next element after ((1, 0), c,(1, 1)) is
 (a) ((1, 0), a,(0, 0))
 (b) ((1, 1), c,(0, 0))
 (c) ((1, 1), a,(0, 0))
 (d) ((1, 1), a,(1, 1))
 (e) ((1, 1), b,(1, 1))

10 Which of the following statements is TRUE?
 (a) For all sets A, B, and C, A − (B − C) = (A − B) − C.
 (b) For all sets A, B, and C, $(A - B) \cap (C - B) = (A \cap C) - B.$
  $(c)\ For\ all\ sets\ A, B, and\ C, (A - B) \cap (C - B) = A - (B \cup C).$
  $(d)\ For\ all\ sets\ A, B, and\ C, if\ A \cap C = B \cap C\ then\ A = B.$
  $(e)\ For\ all\ sets\ A, B, and\ C, if\ A \cup C = B \cup C\ then\ A = B.$

11 Which of the following statements is FALSE?
 $(a)\ C - (B \cup A) = (C - B) - A$
 $(b)\ A - (C \cup B) = (A - B) - C$
 $(c)\ B - (A \cup C) = (B - C) - A$
 $(d)\ A - (B \cup C) = (B - C) - A$
 $(e)\ A - (B \cup C) = (A - C) - B$

12 Consider the true theorem, "For all sets A and B, if A ⊆ B then A ∩ Bc = ∅." Which of the following statements is NOT equivalent to this statement?
 $(a)\ For\ all\ sets\ A\ and\ B, if\ A \subseteq B\ then\ Ac \cap Bc = ∅$
 $(b)\ For\ all\ sets\ A\ and\ B, if\ Ac \subseteq B\ then\ Ac \cap Bc = ∅.$
 $(d)\ For\ all\ sets\ A\ and\ Bc, if\ Ac \subseteq Bc\ then\ Ac \cap B = ∅.$
 $(e)\ For\ all\ sets\ A\ and\ B, if\ Ac \supseteq B\ then\ A \cap B = ∅.$

13 The power set P((A × B) ∪ (B × A)) has the same number of elements as the power set P((A × B) ∪ (A × B)) if and only if
 $(a)\ A = B$
 $(b)\ A = ∅\ or\ B = ∅$
 $(c)\ B = ∅\ or\ A = B$
 $(d)\ A = ∅\ or\ B = ∅\ or\ A = B$
 $(e)\ A = ∅\ or\ B = ∅\ or\ A \cap B = ∅$

14 Let σ = 452631 be a permutation on {1, 2, 3, 4, 5, 6} in one-line notation (based on the usual order on integers). Which of the following is NOT a correct cycle notation for σ?
 (a) (614)(532)
 (b) (461)(352)

(c)   (253)(146)

(d)   (325)(614)

(e)   (614)(253)

15   Let f : X → Y

Consider the statement, "For all subsets C and D of Y , $f^{-1}(C \cap Dc) = f^{-1}(C) \cap$ $[f^{-1}(D)]^c$. This statement is

(a)   True and equivalent to: For all subsets C and D of Y , $f^{-1}(C - D) = f^{-1}(C) - f^{-1}(D)$.

(b)   False and equivalent to: For all subsets C and D of Y , $f^{-1}(C - D) = f^{-1}(C) - f^{-1}(D)$.

(c)   True and equivalent to: For all subsets C and D of Y , $f^{-1}(C - D) = f^{-1}(C) - [f^{-1}(D)]^c$.

(d)   False and equivalent to: For all subsets C and D of Y , $f^{-1}(C - D) = f^{-1}(C) - [f^{-1}(D)]^c$.

(e)   True and equivalent to: For all subsets C and D of Y , $f{-}1(C - D) = [f{-}1(C)]c - f{-}1(D)$.

16   Define $f(n) = n/2 + (1-(-1)n)/4$ for all $n \in Z$. Thus, f : Z → Z, Z the set of all integers. Which is correct?

(a)   f is not a function from Z → Z because n/2 does not belong to Z.

(b)   f is a function and is onto and one-to-one.

(c)   f is a function and is not onto but is one-to-one.

(d)   f is a function and is not onto and not one-to-one.

(e)   f is a function and is onto but not one-to-one.

17   The number of partitions of {1, 2, 3, 4, 5} into three blocks is S(5, 3) = 25. The total number of functions f : {1, 2, 3, 4, 5} → {1, 2, 3, 4} with |Image(f)| = 3 is

(a) 4×6

(b) 4×25

(c) 25×6

(d) $4 \times 25 \times 6$

(e) $3 \times 25 \times 6$

18   Let f : X → Y and g : Y → Z. Let h = $g \circ f : X$ → Z. Suppose g is one-to-one and onto. Which of the following is FALSE?

(a)   If f is one-to-one then h is one-to-one and onto.

(b)   If f is not onto then h is not onto.

(c)   If f is not one-to-one then h is not one-to-one.

(d)   If f is one-to-one then h is one-to-one.

(e)   If f is onto then h is onto.

19   Which of the following statements is FALSE?

(a) $\{2,3,4\} \subseteq A$ implies that $2 \in A$ and $\{3,4\} \subseteq A$.

(b) $\{2,3,4\} \in A$ and $\{2,3\} \in B$ implies that $\{4\} \subseteq A - B$.

(c) $A \cap B \supseteq \{2,3,4\}$ implies that $\{2,3,4\} \subseteq A$ and $\{2,3,4\} \subseteq B$.

(d) $A - B \supseteq \{3, 4\}$ and $\{1, 2\} \subseteq B$ implies that $\{1, 2, 3, 4\} \subseteq A \cup B$.
(e) $\{2, 3\} \subseteq A \cup B$ implies that if $\{2, 3\} \cap A = \emptyset$ then $\{2, 3\} \subseteq B$.

20   Let A = {0, 1} × {0, 1} × {0, 1} and B = {a, b, c} × {a, b, c} × {a, b, c}. Suppose A is listed in lexicographic order based on 0 < 1 and B is listed in lexicographic order based on a < b < c. If A×B ×A is listed in lexicographic order, then the next element after ((0, 1, 1),(c, c, c),(1, 1, 1)) is
(a)   ((1, 0, 1),(a, a, b),(0, 0, 0))
(b)   ((1, 0, 0),(b, a, a),(0, 0, 0))
(c)   ((1, 0, 0),(a, a, a),(0, 0, 1))
(d)   ((1, 0, 0),(a, a, a),(1, 0, 0))
(e)   ((1, 0, 0),(a, a, a),(0, 0, 0))

21   Consider the true theorem, "For all sets A, B, and C if $A \subseteq B \subseteq C$ then $C \, c \subseteq Bc \subseteq Ac$ ". Which of the following statements is NOT equivalent to this statement?
(a) For all sets Ac, Bc, and Cc, if $Ac \subseteq Bc \subseteq Cc$ then $C \subseteq B \subseteq A$.
(b)   For all sets Ac, B, and Cc, if $Ac \subseteq B \subseteq Cc$ then $C \subseteq Bc \subseteq A$.
(c)   For all sets A, B, and Cc, if $Ac \subseteq B \subseteq C$ then $Cc \subseteq Bc \subseteq A$.
(e)   For all sets Ac, Bc, and Cc, if $Ac \subseteq Bc \subseteq C$ then $Cc \subseteq B \subseteq A$.

22   Let $P(A)$ denote the power set of A. If $P(A) \subseteq B$ then
(a) $2|A| \leq |B|$
(b) $2|A| \geq |B|$
(c) $2|A| < |B|$
(d) $|A| + 2 \leq |B|$
(e) $2|A| \geq 2|B|$

23   Let f : {1, 2, 3, 4, 5, 6, 7, 8, 9} → {a, b, c, d, e}. In one-line notation, f = (e, a, b, b, a, c, c, a, c) (use number order on the domain). Which is correct?
(a)   Image(f) = {a, b, c, d, e}, Coimage(f) = {{6, 7, 9}, {2, 5, 8}, {3, 4}, {1}}
(b)   Image(f) = {a, b, c, e}, Coimage(f) = {{6, 7, 9}, {2, 5, 8}, {3, 4}}
(c)   Image(f) = {a, b, c, e}, Coimage(f) = {{6, 7, 9}, {2, 5, 8}, {3, 4}, {1}}
(d)   Image(f) = {a, b, c, e}, Coimage(f) = {{6, 7, 9, 2, 5, 8}, {3, 4}, {1}}
(e)   Image(f) = {a, b, c, d, e}, Coimage(f) = {{1}, {3, 4}, {2, 5, 8}, {6, 7, 9}}

24   Let Σ = {x, y} be an alphabet. The strings of length seven over Σ are listed in dictionary (lex) order. What is the first string after xxxxyxx that is a palindrome (same read forwards and backwards)?
(a)   xxxxyxy
(b)   xxxyxxx
(c)   xxyxyxx
(d)   xxyyyxx
(e)   xyxxxyx

25   Let σ = 681235947 and τ = 627184593 be permutations on {1, 2, 3, 4, 5, 6, 7, 8, 9} in one-line notation (based on the usual order on integers). Which of the following is a correct cycle notation for τ ∘ σ?
(a)   (124957368)
(b)   (142597368)
(c)   (142953768)
(d)   (142957368)
(e) (142957386)

26   Let S = {1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21}. What is the smallest integer N > 0 such that for any set of N integers, chosen from S, there must be two distinct integers that divide each other?
(a)   10
(b)   7
(c)   9
(d)   8
(e)   11

27   The binary relation R = {(0, 0), (1, 1)} on A = {0, 1, 2, 3, } is
(a)   Reflexive, Not Symmetric, Transitive
(b)   Not Reflexive, Symmetric, Transitive
(c)   Reflexive, Symmetric, Not Transitive
(d)   Reflexive, Not Symmetric, Not Transitive
(e)   Not Reflexive, Not Symmetric, Not Transitive

28   Define a binary relation R = {(0, 1), (1, 2), (2, 3), (3, 2), (2, 0)} on A = {0, 1, 2, 3}. The directed graph (including loops) of the transitive closure of this relation has
(a)   16 arrows
(b)   12 arrows
(c)   8 arrows
(d)   6 arrows
(e)   4 arrows

29   Let N+ denote the nonzero natural numbers. Define a binary relation R on N+ × N+ by (m, n)R(s, t) if gcd(m, n) = gcd(s, t). The binary relation R is
(a)   Reflexive, Not Symmetric, Transitive
(b)   Reflexive, Symmetric, Transitive
(c)   Reflexive, Symmetric, Not Transitive
(d)   Reflexive, Not Symmetric, Not Transitive
(e)   Not Reflexive, Not Symmetric, Not Transitive

30   Let N+2 denote the natural numbers greater than or equal to 2. Let mRn if gcd(m, n) >1. The binary relation R on N2 is
(a)   Reflexive, Symmetric, Not Transitive
(b)   Reflexive, Not Symmetric, Transitive
(c)   Reflexive, Symmetric, Transitive

(d)   Reflexive, Not Symmetric, Not Transitive
(e)   Not Reflexive, Symmetric, Not Transitive

31   Which of the following statement is the negation of the statement?
        "2 is even and –3 is negative"?
        (a)   2 is even and –3 is not negative.
        (b)   2 is odd and –3 is not negative.
        (c)   2 is even or –3 is not negative.
        (d)   2 is odd or –3 is not negative.

32   If $A \times B = B \times A$, (where A and B are general matrices) then
        (a) $= j$.
        (b) $A = B'$.
        (c) $B = A$.
        (d) $A' = B$.

33   If $f(x) = \cos x$ and $g(x) = x^3$, then $(f \circ g)(x)$ is
        (a) $(\cos x)^3$.
        (b) $\cos 3x$.
        (c) $x^{(\cos x)3}$.
        (d) $\cos x^3$.

34      $p \vee q$ is logically equivalent to
        (a) $\sim q \wedge p$
        (b) $\sim p \vee q$
        (c) $\sim p \wedge \sim q$
        (d) $\sim p \vee \sim q$

35   The number of distinguishable permutations of the letters in the word BANANA are,
        (a)   60.
        (b)   36.
        (c)   20.
        (d)   10.

36   Which of the following pair is not congruent modulo 7?
        (a)   10, 24
        (b)   25, 56
        (c)   -31, 11
        (d)   -64, -15

37      $[\sim q \wedge (p \to q)] \to \sim p$ is,
        (a)   Satisfiable.
        (b)   Unsatisfiable.
        (c)   Tautology.
        (d)   Invalid.

38   Which of the following is not a well formed formula?
      (a) $\forall x\ [P(x) \rightarrow f(x) \wedge x]$
      (b) $[(\ )]\ \forall x1 \forall x2 \forall x3\ x1 = x2 \wedge x2 = x3 \_ x1 = x3$
      (c) $\sim (p \rightarrow q) \rightarrow q$
      (d) $[T \vee P(a, b)] \rightarrow \exists z Q(z)$

39   The description of the shaded region in the following figure using the operations   on
      set   is,
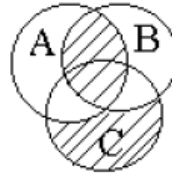
      (a) $C \cup (A \cap B)$
      (b) $(C - ((A \cap C) \cup (C \cap B))) \cup (A \cap B)$
      (c) $(C - (A \cap C) \cup (C \cap B)) \cup (A \cap B)$
      (d) $A \cup B \cup C - (C \cup (A \cap B))$

40   The sum of the entries in the fourth row of Pascal's triangle is
      (a)   8
      (b)   4
      (c)   10
      (d)   16

41.   Consider the statement form $p \Rightarrow q$ where p ="If Tom is Jane's father then Jane is
      Bill's niece" and q ="Bill is Tom's brother." Which of the following statements is
      equivalent to this statement?

      (a)   If Bill is Tom's Brother, then Tom is Jane's father and Jane is not Bill's niece.
      (b)   If Bill is not Tom's Brother, then Tom is Jane's father and Jane is not Bill's
             niece.
      (c)   If Bill is not Tom's Brother, then Tom is Jane's father or Jane is Bill's niece.
      (d)   If Bill is Tom's Brother, then Tom is Jane's father and Jane is Bill's niece.
      (e)   If Bill is not Tom's Brother, then Tom is not Jane's father and Jane is Bill's
             niece.

42.   Consider the statement, "If n is divisible by 30 then n is divisible by 2 and by 3 and by 5."
      Which of the following statements is equivalent to this statement?
      (a)   If n is not divisible by 30 then n is divisible by 2 or divisible by 3 or divisible by
             5.
      (b)   If n is not divisible by 30 then n is not divisible by 2 or not divisible by 3 or not
             divisible by 5.
      (c)   If n is divisible by 2 and divisible by 3 and divisible by 5 then n is divisible by
             30.
      (d)   If n is not divisible by 2 or not divisible by 3 or not divisible by 5 then n is not
             divisible by 30.

(e)   If n is divisible by 2 or divisible by 3 or divisible by 5 then n is divisible by 30.

43.   Which of the following statements is the contrapositive of the statement, "You win the game if you know the rules but are not overconfident?"
(a)   If you lose the game then you don't know the rules or you are overconfident.
(b)   A sufficient condition that you win the game is that you know the rules or you are not overconfident.
(c)   If you don't know the rules or are overconfident you lose the game.
(d)   If you know the rules and are overconfident then you win the game.
(e)   A necessary condition that you know the rules or you are not overconfident is that you win the game.

44.   The statement form $(p \Leftrightarrow r) \Rightarrow (q \Leftrightarrow r)$ is equivalent to

(a) $[(\neg p \wedge r) \wedge (p \vee \neg r)] \vee \neg [(\neg q \vee r) \wedge (q \vee \neg r)]$

(b) $\neg [(\neg p \vee r) \wedge (p \vee \neg r)] \wedge [(\neg q \vee r) \wedge (q \vee \neg r)]$

(c) $[(\neg p \vee r) \wedge (p \vee \neg r)] \wedge [(\neg q \vee r) \wedge (q \vee \neg r)]$

(d) $[(\neg p \vee r) \wedge (p \vee \neg r)] \vee [(\neg q \vee r) \wedge (q \vee \neg r)]$

(e) $\neg [(\neg p \vee r) \wedge (p \vee \neg r)] \wedge [(\neg q \vee r) \wedge (q \vee \neg r)]$

45.   Consider the statement, "Given that people who are in need of refuge and consolation are apt to do odd things, it is clear that people who are apt to do odd things are in need of refuge and consolation." This statement, of the form $(P \Rightarrow Q) \Rightarrow (Q \Rightarrow P)$, is logically equivalent to
(a)   People who are in need of refuge and consolation are not apt to do odd things.
(b)   People are apt to do odd things if and only if they are in need of refuge and consolation.
(c)   People who are apt to do odd things are in need of refuge and consolation.
(d)   People who are in need of refuge and consolation are apt to do odd things.
(e)   People who aren't apt to do odd things are not in need of refuge and consolation.

46.   A sufficient condition that a triangle T be a right triangle is that $a^2 + b^2 = c^2$. An equivalent statement is

(a)   If T is a right triangle then $a^2 + b^2 = c^2$.
(b)   If $a^2 + b^2 = c^2$ then T is a right triangle.
(c)   If $a^2 + b^2 \neq c^2$ then T is not a right triangle.
(d)   T is a right triangle only if $a^2 + b^2 = c^2$.
(e)   T is a right triangle unless $a^2 + b^2 = c^2$.

47. Which of the following statements is NOT equivalent to the statement, "There exists either a computer scientist or a mathematician who knows both discrete math and Java."
    (a) There exists a person who is a computer scientist and who knows both discrete math and Java or there exists a person who is a mathematician and who knows both discrete math and Java.
    (b) There exists a person who is a computer scientist or there exists a person who is a mathematician who knows discrete math or who knows Java.
    (c) There exists a person who is a computer scientist and who knows both discrete math and Java or there exists a mathematician who knows both discrete math and Java.
    (d) There exists a computer scientist who knows both discrete math and Java or there exists a person who is a mathematician who knows both discrete math and Java.
    (e) There exists a person who is a computer scientist or a mathematician who knows both discrete math and Java.

48. Which of the following is the negation of the statement, "For all odd primes $p < q$ there exists positive non-primes $r < s$ such that $p^2 + q^2 = r^2 + s^2$."
    (a) For all odd primes $p < q$ there exists positive non-primes $r < s$ such that $p^2 + q^2 \neq r^2 + s^2$
    (b) There exists odd primes $p < q$ such that for all positive non-primes $r < s$, $p^2 + q^2 = r^2 + s^2$
    (c) There exists odd primes $p < q$ such that for all positive non-primes $r < s$, $p^2 + q^2 \neq r^2 + s^2$
    (d) For all odd primes $p < q$ and for all positive non-primes $r < s$, $p^2 + q^2 \neq r^2 + s^2$.
    (e) There exists odd primes $p < q$ and there exists positive non-primes $r < s$ such that $p^2 + q^2 \neq r^2 + s^2$

49. Consider the following assertion: "The two statements

    (1) $\exists x \in D, (P(x) \wedge Q(x))$ and

    (2) $(\exists x \in D, P(x)) \wedge (\exists x \in D, Q(x))$ have the same truth value." Which of the following is correct?

    (a) This assertion is false. A counterexample is $D = N$, $P(x) =$ "x is divisible by 6," $Q(x) =$ "x is divisible by 3."

    (b) This assertion is true. The proof follows from the distributive law for $\wedge$.

    (c) This assertion is false. A counterexample is $D = Z$, $P(x) =$ "x < 0," $Q(x) =$ "x ≥ 0."

(d) This assertion is true. To see why, let D = N, P(x) = "x is divisible by 6," Q(x) = "x is divisible by 3." If x = 6, then x is divisible by both 3 and 6 so both statements in the assertion have the same truth value for this x.

(e) This assertion is false. A counterexample is D = N, P(x) = "x is a square," Q(x) = "x is odd."

50. Which of the following is an unsolved conjecture?

(a) $\exists n \in \mathbb{N},\ 2^{2^n} + 1 \notin \mathbb{P}$

(b) $\exists K \in \mathbb{N},\ \forall n \geq K,\ n\ \text{odd},\ \exists p, q, r \in \mathbb{P},\ n = p + q + r$

(c) $(\exists\ x, y, z, n \in \mathbb{N}^+,\ x^n + y^n = z^n) \Leftrightarrow (n = 1, 2)$

(d) $\forall m \in \mathbb{N},\ \exists\ n \geq m,\ n\ \text{even},\ \exists p, q \in \mathbb{P},\ n = p + q$

(e) $\forall m \in \mathbb{N},\ \exists\ n \geq m,\ n \in \mathbb{P}\ \text{and}\ n + 2 \in \mathbb{P}$

Ans. (1)(a), (2)(b), (3)(c), (4)(e), (5)(a), (6)(b), (7)(c),(8)(e), (9)(c), (10)(b), (11)(d), (12)(a), (13)(d), (14)(b), (15)(a),(16) (e), (17)(d), (18) (a), (19)(b), (20)(e), (21)(d), (22)(a), (23)(c), (24)(b), (25)(d), (26)(d), (27)(b), (28)(a), (29)(b), (30)(a), (31)(d), (32)(c), (33)(d), (34)(c), (35)(a), (36)(b), (37)(c), (38)(b), (39)(b), (40)(a), (41)(b), (42)(d), (43)(a), (44)(e), (45)(c), (46)(b), (47)(b), (48)(c), (49)(c), (50)(e)

(c) Fill in the Blanks:

1 The symmetric difference of {1,3,5} and {1,2,3} is _____.
2 If A symmetric difference B = A than the sets A and B are called_____.
3 The power set of the empty set is_____.
4 The power set of the set {Ø} is _____.
5 The minimum number of students in a class to be sure that three of them are born in the same month is _____.
6 _____ committees of three can be formed from eight people.
7 A woman has 11 close friends _____ many ways she can invite five of them to dinner.
8 The co-efficient of $x^{12}y^{13}$ in the expansion of (2x-3y)^{25} is_____.

Ans. (1)(2, 5), (2)(B=Ø), (3)(Ø), (4)({ Ø,{ Ø}}), (5)(25), (6)(56), (7)(462)

II   Short Answer Types Questions:

1 What are the sets in the partition of the integers arising from congruence module 4?
Ans. [0] = {....-8,-4, 0, 4, 8,....} , [1] = {....-7,-3, 1, 5, 9,....}, [2] = {....-6,-2, 2, 6, 10,....} [3] = {....-5,-1, 3, 7, 11,....}

2 Among a group of 165 students, 8 are taking calculus, psychology & computer science; 33 are taking calculus & computer science, 20 are taking calculus & psychology, 24 are

taking psychology & computer science, 79 are taking calculus, 83 are taking psychology, 63 are taking computer science. How many are taking none of the three subjects?

Ans.   9

3   Show that the set of all integers is countable.

4   Show that the set of odd positive integers is a countable set.

5   Let ~ denote the relation on the set Z of integers, where integers x and y satisfy $x \sim y$ if and only if xy is divisible by 3. Is the relation ~ reflexive? Is it symmetric? Is it transitive? Is it an equivalence relation? Is it a partial order? [Justify your answers.]

Ans.   No, Yes, Yes, No, No

6   Let R denote the relation on the set N of natural numbers, where natural numbers m and n satisfy mRn if and only if $n = 2^k m$ for some integer k (which may be positive, zero or negative). Is the relation R reflexive? Is it symmetric? Is it transitive? Is it an equivalence relation? Is it a partial order? [Justify your answers.]

Ans.   Yes, Yes, Yes, Yes, Yes

7   Prove that if $n > 4$ is composite, then n divides $(n-1)!$.

8   Prove that there is no primes triple p, $p+2$, $p+4$ except for 3,4,5.

9   An urn contains 28 blue marbles, 20 red marbles, 12 white marbles, 10 yellow marbles, and 8 magenta marbles. How many marbles must be drawn from the urn in order to assure that there will be 15 marbles of the same color?

Ans.   45

10   Let s be a positive integer. Prove that the closed interval $[s;2s]$ contains a power of 2.

11   How many bit strings of length eight either start with a 1 bit or and end with the two bits 00?

Ans.   32 ways

12   Let A = {0,2,4,6,8}, B = {0,1,2,3,4} and C = {0,3,6,9}. What are A U B U C and A∩B∩ C?

Ans.   A U B U C = {0,1,2,3,4,6,8,9}
       $A \cap B \cap C$ = {0}

13   Determine whether the function f from {a,b,c,d} to {1,2,3,4,5} with f(a)=4, f(b)=5, f(c)=1 and f(d)=3 is one to one

Ans: Function f is one to one because f takes on different values at the four elements of its domain.

14   Prove or disprove the statement that if x and y are real numbers, $(x^2 = y^2) \Leftrightarrow (x = y)$

15   Show by induction, that for all $n \geq 1$,

$$1+2+3+\ldots.+n = \frac{n(n+1)}{2}$$

16   How many seven different person committees can be formed each containing three women from an available set of 20 women and four men from an available set of 30 men?

Ans: 31,241,700 different committees

17   Construct truth table for $(pVq) \rightarrow (p\wedge q)$.

Ans: $[T\ F\ F\ T]^T$

18   Write PNDF (Principle disjunctive normal form) of $(pV \neg q)$.

Ans: $(p\wedge q)V(p\wedge\neg q)\ V\ (\neg pV\neg q)$

19   Prove that $(A - C) \cap (C - B) = \emptyset$ analytically, where A, B, C are sets.

20   Define binary relation from one set to another. Give an example.

21   If $*$ is a binary operation on the set R of real numbers defined by a*b=a+b+2ab, a, b $\in$ R. Find a^{-1}.

22   Let Z+ be set of positive integers. Let R be a relation defined on Z+ as follows: aRb $\Leftrightarrow$ a divides b. Give the type of the relation R.

23   Show that $A \cap B = A \cup B$. Where A and B are sets.

24   Define binary relation. How many binary relations are there on a set A with n elements?

25   Find the minimum number of student in a class so that three of them are born on the same day.

26   How many ways can a group of 6 people be seated around a table?

27   Let A be a set with n elements, find how many relations on A are there which (i) symmetric and (ii) antisymmetric.

28   How many integers must you pick in order to be sure that at least two of them have the same remainder when divided by 7?

29   Use proof by cases to show that $|xy| = |x||y|$, where x and y are real numbers.

30   How many solutions are there for the equation X+Y+Z=17, where X, Y, Z are non negative integers.

31   What is the coefficient of x^8y^9 in the expansion of $(3x+2y)^{17}$.

32   How many solutions are there for the equation X+Y+Z=17, where X, Y, Z are non negative integers.

33   Show that $(A-C) \cap (C-B) = \varphi$, without using Venn diagrams. Where A, B, C are non-empty sets.

34   If R and S are relations from A to B such that $R \subseteq S$ then prove that $R^{-1} \subseteq S^{-1}$.
35   Prove that $p \to (p \lor \lor q)$ is a tautology.
36   How many diagonals are there in a regular decagon?
37   Show that if any 5 numbers from 1 to 8 are chosen, then 2 of them will add up to 9.
38   How many ways are there to arrange $7 -$ sign and $5 +$ sign, such that no two + signs are together?
39   A knight is a person who always tells a truth and knave always lies. We have two people A and B such that A says "B is a knight", B says "the two of us are opposite". What are A and B?
40   Let Z be the set of all integers and R be a relation defined on Z such that for any a,b ϵ Z, aRb if and only if ab>=0. Is R an equivalence relation?
41   Show that a set of n elements can have 2^n subsets.
42   Prove that $|x\ y| = |x|\ |y|$ is true for all real numbers x and y.
43   A man wants to buy some pet birds. The pet store sells parrots, sparrows and mainas. How many different selections are possible if the man wants to take home 7 birds.
Ans: 35

44   If $A = \{x | 3x^2 - 7x - 6 = 0\}$ and $B = \{x | 6x^2 - 5x - 6 = 0\}$. Find $A \cap B$.

Ans: $\dfrac{-2}{3}$

45   Show that $\neg P \land (\neg q \land r) \lor (q \land r) \lor (p \land r) \equiv r$.
46   Prove without using the truth table that the following statements are tautology:-
      (i) $(p \lor \neg q) \to r \leftrightarrow \neg (q \to p) \lor r$
      (ii) $(p \to q) \land (q \to r) = (p \to r)$.
47   Suppose there are 15 red balls and 5 white balls. Assume that the balls are distinguishable and that a sample of 5 balls is to be selected.
      (i)   How many samples of 5 balls are there?
      (ii)   How many samples contain all red balls?
      (iii)   How many samples contain 3 red balls and 2 white balls?
      (iv)   How many samples contain atleast four red balls?

Ans: $^{20}C_5, {}^{15}C_5, {}^5C_3{}^5C_2, {}^{15}C_4\ {}^5C_1 + {}^{15}C_5$

48   Let $N = \{0, 1, 2, 3, \ldots\}$. Define functions f, g and h from set N to N by $f(n) = n+1$, $g(n) = 2n$, and
      $h(n) = \begin{cases} 0 & \text{if n is even} \\ 1 & \text{if n is odd} \end{cases}$. Compute go(fog). Is the function h invertible? Is the function f onto?

Ans: 4n+2,h is not one-one

49   Show that a set of n elements can have 2^n subsets.

50   Define binary relation. How many binary relations are there on a set A with n elements?

Ans; 2^{n^2}

51   How many ways are there to arrange 7 – sign and 5+ sign, such that no two + signs are together?

Ans: 56

52   The set P ({a,b,c}) is partially ordered with respect to the subset relation. Find a chain of length 3 in P.

III   Long Answer Types Questions:

1   Show that the set of real numbers is an uncountable set.

2   What is the least number of area codes needed to guarantee that the 25 million phones in a state have distinct ten digit telephone numbers? (Assume that telephone numbers are of the form NXX – NXX-XXXXX, where the first three digits form the area code, N represents a digit from 2 to 9 inclusive & X represents any digit.

Ans.   At least 4 media codes are required.

3   For each of the following relations, determine whether or not that relation is reflexive, symmetric, transitive, anti-symmetric, an equivalence relation, and/or a partial order, giving appropriate reasons for your answers:-

   (i)   The relation P on the set Z of integers, where integers x and y satisfy xPy if and only if $x^2 \le y^2$;

   (ii)   The relation Q on the set Z of integers, where integers x and y satisfy xQy if and only if $x - y = k^3$ for some integer k;

   (iii)   The relation R on the set N of natural numbers, where natural numbers m and n satisfy mRn if and only if $m + 1$ divides $n + 1$ (i.e., if and only if $n+1 = k(m +1)$ for some integer k);

   (iv)   The relation S on the set Z of integers, where integers x and y satisfy xSy if and only if xy is even.

Ans.   (i)   reflexive, transitive, anti-symmetric
   (ii)   reflexive, symmetric
   (iii)   reflexive, anti- symmetric;
   (v)   symmetric

4   Let p <q be two consecutive odd primes. Prove that p+qis a composite number, having at least three, not necessarily distinct, prime factors**.**

5   Find the transitive closure of the relation R where
   M_R =

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{pmatrix}$$

Ans.

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$$

6   The nine entries of a 3×3 grid are filled with -1, 0, or 1. Prove that among the eight resulting sums (three columns, three rows, or two diagonals) there will always be two that add to the same number.

7   Given any set of ten natural numbers between 1 and 99 inclusive, prove that there are two disjoint nonempty subsets of the set with equal sums of their elements.

8   Label one disc "1", two discs "2", three discs "3", . . . , fifty discs "50". Put these 1+2+3+···+50 = 1275 labeled discs in a box. Discs are then drawn from the box at random without replacement. What is the minimum number of discs that must me drawn in order to guarantee drawing at least ten discs with the same label?

Ans.   415

9   An urn has 900 chips, numbered 100 through 999. Chips are drawn at random and without replacement from the urn, and the sum of their digits is noted. What is the smallest number of chips that must be drawn in order to guarantee that at least three of these digital sums be equal?

Ans.   3

10   An eccentric widow has five cats1. These cats have 16 kittens among themselves. What is the largest integer n for which one can say that at least one of the five cats has n kittens?

Ans.   4

11   No matter which fifty five integers may be selected from{1,2, . . . ,100}, prove that one must select some two that differ by 10.

12   Prove that the sum of two rational numbers is rational.

13   Use a proof of cases to show that $|xy| = |x||y|$ where x & y are real numbers.

14   Show that these statements are equivalent:
P_1: n is odd integer
P_2: n^2 is odd.

15   Prove by induction on n that the product $1 \times 3 \times ... \times (2n-1)$ of the first n odd natural numbers is equal to $\dfrac{(2n)!}{2^n n!}$.

16   Prove by induction on n that $(3n)! > 2^{6n-4}$ for the entire natural numbers n.

17   Show that
$$\sum_{i=k}^{n} C(i,k) = C(n+1, k+1)$$

18   Use PMI to prove the following
$1+2+2^2+\_\ \_\ \_\ \_ + 2^n = 2^{n+1} - 1$
positive integer n

19   Prove by induction on n that
$$\sum_{i=1}^{n} 4^{i-1} i(i+1) = \frac{1}{27}(9n^2 + 3n + 2)4^n - 2$$
for all natural number n.

20   Verify that the proposition $p \wedge (q \wedge \sim p)$ is a contradiction.

21   Show that at least four of any 22 days must fall on the same day of the week.

22   Show that the hypotheses "It is not sunny this afternoon & its colder than yesterday", we will go swimming only if it is sunny", "If we do not go swimming, then we will take a canoe trip", and "It we take a canoe trip, then we will be name by sunset" lead to the conclusion "we will be home by sunset".

23   Show that the hypotheses "If you send me an e-mail message than I will finish writing the program", If you do not send me an e-mail message, then I will go to sleep early", & if I go to sleep early, then I will woke up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will woke up feeling refreshed".

24   Let R be a relation on the set of real numbers such that an R biff a-b is an integer. Show that R is an equivalence relation.

25   What do you mean by indirect proof? Using indirect proof prove that "If $2n+2$ is odd, then n is off".

26   Show by mathematical induction $\forall n \in N \left[\sum_{i=0}^{n} i = \frac{n(n+1)}{2} \right]$

27   Without using truth table, prove the following
$(p \vee p) \wedge (p \wedge (p \wedge q)) = (p \wedge q).$

28   Let be the set of all strings of length 3 made up of 0's and 1's i.e.
$$\sum 3 :: \{000,001,010,100,011,110,101,111\}. h : P(\{a,b,c\}) \to \sum 3, h(X) = s_1 s_2 s_3$$
With $s_1 = 1$ if $a \in X$ and 0 otherwise $s_2 = 1$ if $b \in X$ and 0 otherwise, $s_3 = 1$ if $c \in X$ and 0 otherwise. Show that h is a bijection.

29   Find the conclusion for the following hypotheses:
It is not sunny this afternoon and it is colder than yesterday.
We will go swimming only if it is sunny.

If we do not go swimming, then we will take a canoe trip.

If we take a canoe trip, then we will be home by sunset.

30   Use mathematical induction to show that $H_{2^n} \geq 1 + \frac{n}{2}$ whenever n is a nonnegative integer. Where $H_j = 1 + \frac{1}{2} + \frac{1}{3} + \cdots \ldots + \frac{1}{j}$.

31   Define function. Find the inverse of f(n) = 2(x-2)^2 + 3 for all x<=2.

32   Find the number of integers between 1 and 100 that are divisible by any of the integer 2, 3, 5, 7.

33   Check the validity of the following argument :-

"If the labour market is perfect then the wages of all persons in a particular employment will be equal. But it is always the case that wages for such persons are not equal therefore the labour market is not perfect."

34   What are the different types of quantifiers? Explain in brief.

Show that $(\exists x)(P(x) \wedge Q(x)) \rightarrow (\exists x) P(x) \wedge (\exists x) Q(x)$

35   Define tautology and contradiction. Show that "If the sky is cloudy then it will rain and it will not rain", is not a contradiction.

36   How many words of 4 letters can be formed with the letters a, b, c, d, e, f, g and h, when

(i) e and f are not to be included and

(ii) e and f are to be included.

Ans: 360, 1680

37   Prove by elimination of cases : if X is a number such that
$$X^2 - 5X + 6 = 0 \text{ then } X = 3 \text{ or } X = 2.$$

38   Prove or disprove the following equivalence,

$\sim (p \leftrightarrow q) \equiv ((p \wedge \sim q) \vee (q \wedge \sim p))$

39   Let Z be the set of all integers and R be a relation define on Z such that for any a,b ∈ z, aRb if and only if ab≥0. Is R an equivalence relation?

40   Find the number of integers between 1 and 100 that are divisible by any of the integer 2,3,5,7.

Ans: 76

41   Show by Mathematical Induction:
$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} \quad \forall n \in N$$

42   Without using truth table, prove the following:

$(\neg p \vee \vee q) \wedge \wedge (p \wedge (p \wedge \wedge q)) \equiv (p \wedge \wedge q)$

43   Define function. Find the inverse of function f(x) = 1/x-1, x ≠1. Ans: f^{-1} (x) = $\frac{x+1}{x}$

UNIT – II

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   The divisibility relation | is a partial ordering on the set of positive integers.
2   The divisibility relation | is a partial ordering on the set of integers.
3   The poset (P(S), contained relation) is a lattice, where S is a set.
4   Every non empty poset (S,≤) has at least one minimal element
5   In Boolean algebra, law of Duality holds.
6   p↔q is equivalent to $(p \land q) \lor (\neg p \land \neg q)$.
7    $(\neg q \land (p \to q)) \to \neg p$ is a tautology.
8   If B is a Boolean Algebra, then B is a finite but not complemented lattice.
9   If B is a Boolean Algebra, then B is a finite, complemented and distributive lattice.
10   If B is a Boolean Algebra, then B is a finite, distributive but not complemented lattice.
11   If B is a Boolean Algebra, then B is not distributive lattice.
12   Logic diagrams and truth tables are equally powerful in expressing the processing of gates and circuits.
13   Boolean expressions are more powerful than logic diagrams in expressing the processing of gates and circuits.
14   A full adder takes the carry-in value into account.
15   A multiplexer adds all of the bits on its input lines to produce its output.

Ans.   (1)(T), (2)(F), (3)(T), (4)(F), (5)(T), (6)(T), (7)(T), (8)(F), (9)(T), (10)(F), (11)(F), (12)(T), (13)(F), (14)(T), (15)(F)

(b)   Multiple Choice Questions:

Answer the following questions for the poset({3,5,9,15,24,45},|)

1   Find the maximal elements.
(a)   15,45
(b)   24,45
(c)   15,24
(d)   3,5

2   Find the minimal elements.
(a)   3,5
(b)   3
(c)   5,9
(d)   24,45

3   Find all upper bounds of {3,5}.
(a)   24,45
(b)   15,45
(c)   15,24
(d)   5,9

4   Find all lower bounds of {15,45}.
     (a) 3,5
     (b) 5,9
     (c) 15,5,3
     (d) 15,24

5   Which of the following are Boolean identities?
     (a) Idempotent laws.
     (b) Commutative laws.
     (c) Associative laws.
     (d) De Morgan's laws.
     (e) All of above

6   The statement $\neg(p \vee (\neg p \wedge q)))$ is logically equivalent to
     (a) $p \wedge \neg q$
     (b) $\neg p \wedge q$
     (c) $\neg p \vee \neg q$
     (d) $\neg p \wedge \neg q$

7    $p \wedge T \equiv p$ and $p \vee F \equiv p$ is
     (a) Identity laws
     (b) Idempotent laws
     (c) Domination laws
     (d) Associative laws.

8   A Karnaugh map for 6 variables will have _____ squares.
     (a) 16
     (b) 32
     (c) 64
     (d) 128

9   How many different Boolean functions of degree 7 are there?
     (a) 7
     (b) 128
     (c) 228
     (d) 2128

10   The idempotent laws of Boolean algebra state that:
     (a)   x + x = 2x
     (b)   x * x = x2
     (c)   x + x = x
     (d)   x * x = 2x
11   The identity, x + yz = (x + y)(x + z) is known as:
     (a)   De Morgan's law.
     (b)   Distributive law.
     (c)   Associative law.

(d)   commutative law

12   If B is a Boolean algebra, then which of the following is true?
(a) B is a finite but not complemented lattice.
(b) B is a finite, complemented and distributive lattice.
(c) B is a finite, distributive but not complemented lattice.
(d) B is not distributive lattice.

13   The Boolean expression XY + XY' + X'Z + XZ' is independent of the Boolean variable:
(a) Y
(b) X
(c) Z
(d) None of these

14   Let * be a Boolean operation defined by
A * B = AB + A B , then A*A is:
(a)   A
(b)   B
(c)   0
(d)   1

15   If B is a Boolean Algebra, then which of the following is true
(a)   B is a finite but not complemented lattice.
(b)   B is a finite, complemented and distributive lattice.
(c)   B is a finite, distributive but not complemented lattice.
(d)   B is not distributive lattice.

16   A partial ordered relation is transitive, reflexive and
(a)   Antisymmetric.
(b)   Bisymmetric.
(c)   Antireflexive.
(d)   Asymmetric

17   Whether the relation R on the set of all integers is reflexive, symmetric, antisymmetric, or transitive, where(x, y)∈R if and only if xy ≥1
(a)   Anti symmetric
(b)   Transitive
(c)   Symmetric
(d)   Both Symmetric and transitive

18   Let N = {1, 2, 3, ….} be ordered by divisibility, which of the following subset is totally ordered,
(a)   (2, 6, 24).
(b)   (3, 5, 15).
(c)   (2, 9, 16).

(d)   (4, 15, 30).

19   Let A = {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16} and consider the divide relation on A. Let C denote the length of the maximal chain, M the number of maximal elements, and m the number of minimal elements. Which is true?
(a)   C = 3, M = 8, m = 6
(b)   C = 4, M = 8, m = 6
(c)   C = 3, M = 6, m = 6
(d)   C = 4, M = 6, m = 4

20   A self-complemented, distributive lattice is called
(a)   Boolean Algebra
(b)   Modular lattice
(c)   Complete lattice
(d)   Self-dual lattice

21   A relation that is reflexive, anti-symmetric and transitive is a
(a)   Function
(b)   Equivalence relation
(c)   Partial order
(d)   None of these

22   Which of the partially ordered sets in figures are lattices?

(i)   (ii)   (iii)
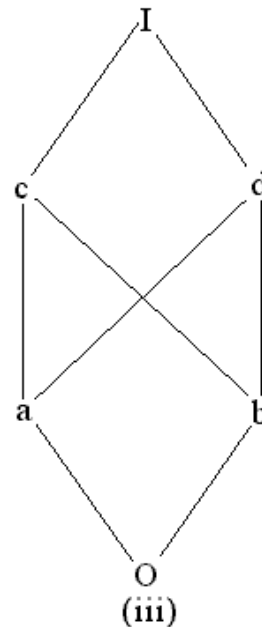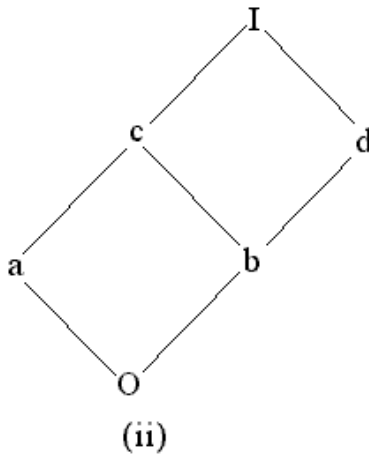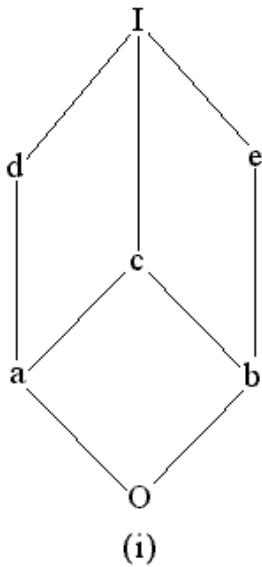
(a)   (i)
(b)   (ii)
(c)   (iii)
(d)   All of the above

23   Let R = {(a, a), (a, b), (b, b), (a, c), (c, c)} be a partial order relation on Σ = {a, b, c}.
      Let $\leq$ be the corresponding lexicographic order on Σ^*. Which of the following is true?
      (a)   bc $\leq$ ba
      (b)   abbaaacc $\leq$ abbaab
      (c)   abbac $\leq$ abb
      (d)   abbac $\leq$ abbab

24   Consider the divides relation, m | n, on the set A = {2, 3, 4, 5, 6, 7, 8, 9, 10}. The cardinality of the covering relation for this partial order relation (i.e., the number of edges in the Hasse diagram) is
      (a)   4
      (b)   6
      (c)   5
      (d)   7

25   Consider the divides relation, m | n, on the set A = {2, 3, 4, 5, 6, 7, 8, 9, 10}. Which of the following permutations of A is not a topological sort of this partial order relation?
      (a)   7,2,3,6,9,5,4,10,8
      (b)   2,3,7,6,9,5,4,10,8
      (c)   2,6,3,9,5,7,4,10,8
      (d)   3,7,2,9,5,4,10,8,6

26   The inclusion of which of the following sets into S = {{1, 2}, {1, 2, 3}, {1, 3, 5}, {1, 2, 4}, {1, 2,3,4, 5}} is necessary and sufficient to make S a complete lattice under the partial order defined by set containment?
      (a)   {1}
      (b)   {1},{2,3}
      (c)   {1},{1,3}
      (d)   {1},{1,3},{1,2,3,4},{1,2,3,5}

27   Let L be a set with a relation R which is transitive, anti-symmetric and reflexive and for any two elements a, b Î L let the least upper bound lub (a, b) and the greatest lower bound glb (a, b) exist. Which of the following is/are true?
      (a)   L is a poset
      (b)   L is a boolean algebra
      (c)   L is a lattice
      (d)   None of the above

28   The following is the Hasse diagram of the poset
      The poset is:
      (a)   not a lattice
      (b)   a lattice but not a distributive lattice
      (c)   a distributive lattice but not a Boolean algebra
      (d)   a Boolean algebra

```
                    a
                   /|\
                  / | \
              b  /  |  \  d
               \ c  |  /
                \ | | /
                 \|||/
                   e
```
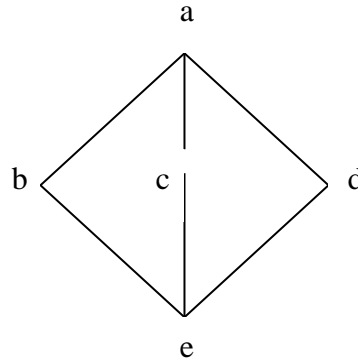
29   A Poset is a lattice if for every pair of vertices
      (a)   GLB exists
      (b)   LUB exits
      (c)   Both (a) and (b)
      (d)   None of these

30   Every linearly ordered set is a lattice
      (a)   True
      (b)   False

31   A partial ordered relation is transitive, reflexive and
      (a)   antisymmetric.
      (b)   bisymmetric.
      (c)   antireflexive.
      (d)   asymmetric.

32   Let N = {1, 2, 3, ….} be ordered by divisibility, which of the following subset is totally
      ordered,
      (a)   (2, 6, 24)
      (b)   (3, 5, 15)
      (c)   (2, 9, 16)
      (d)   (4, 15, 30)

33   If B is a Boolean algebra, then which of the following is true
      (a)   B is a finite but not complemented lattice.
      (b)   B is a finite, complemented and distributive lattice.
      (c)   B is a finite, distributive but not complemented lattice.
      (d)   B is not distributive lattice.

34   The minimized expression of ABC +ABC +ABC +ABC is
      (a) $A + \bar{C}$.
      (b) $\bar{B}C$.
      (c) $\bar{C}$.
      (d)   C.

35   For the sequence defined by the following recurrence relation $T_n = nT_{n-1}$ with initial condition $T_1 = 7$, the explicit formula for T_n is

         (A) $T_n = n\,7^{n-1}$ (B) $T_n = 7.n!$

         (C) $T_n = \dfrac{n!}{7}$ (D) $T_n = n! - 7$

36   Let L be a lattice. Then for every a and b in L which one of the following is correct?
         (a) $a \vee b = a \wedge b$
         (b) $a \vee (B \vee C) = (a \vee B) \vee C$
         (c) $a \vee (b \wedge c) = a$
         (d) $a \vee (b \vee c) = b$

37   A self-complemented, distributive lattice is called
         (a)   Boolean Algebra
         (b)   Modular lattice
         (c)   Complete lattice
         (d)   Self dual lattice

38   Let * be a Boolean operation defined by
     $A * B = AB + A\,B$, then $A*A$ is:
         (a)   A
         (b)   B
         (c)   0
         (d)   1

39   The Boolean expression $XY + XY' + X'Z + XZ'$ is independent of the   Boolean variable:
         (a)   Y
         (b)   X
         (c)   Z
         (d)   None of these

40   The Boolean expression $A\square\square AB \square\square A\bar{B}$ is independent to
         (a)   A
         (b)   B
         (c)   Both A and B
         (d)   None

41   Let
     m = "Juan is a math major,"
     c = "Juan is a computer science major,"
     g = "Juan's girlfriend is a literature major,"
     h = "Juan's girlfriend has read Hamlet," and
     t = "Juan's girlfriend has read The Tempest."

Which of the following expresses the statement "Juan is a computer science major and a math major, but his girlfriend is a literature major who hasn't read both The Tempest and Hamlet."

(a)   c ∧ m ∧ (g ∨ (¬h ∨ ¬t))
(b)   c ∧ m ∧ (g ∧ (¬h ∧ ¬t))
(c)   c ∧ m ∧ (g ∧ (¬h ∨ ¬t))
(d)   c ∧ m ∧ (g ∨ (¬h ∧ ¬t))
(e)   c ∧ m ∧ (g ∨ (h ∨ t))

42. The function ((p ∨ (r ∨ q)) ∧ ¬ (¬q ∧ ¬r) is equal to the function
(a)   q ∨ r
(b)   ((p ∨ r) ∨ q)) ∧ (p ∨ r)
(c)   (p ∧ q) ∨ (p ∧ r)
(d)   (p ∨q) ∧ ¬ (p ∨ r)
(e)   (p ∧ r) ∨ (p ∧ q)

43. The truth table for (p ∨ q) ∨ (p ∧ r) is the same as the truth table for
(a)   (p ∨ q) ∧ (p ∨ r)
(b)   (p ∨ q) ∧ r
(c)   (p ∨ q) ∧ (p ∧ r)
(d)   p ∨ q
(e)   (p ∧q) ∨ p

44. The Boolean function [¬ (¬p∧q) ∧¬ (¬p∧¬q)] ∨ (p∧r) is equal to the Boolean function
(a)   q
(b)   p ∧ r
(c)   p ∨ q
(d)   r
(e)   p

45. Which of the following functions is the constant 1 function?
(a)   ¬p ∨ (p ∧ q)
(b)   (p ∧ q) ∨ (¬p ∨ (p ∧ ¬q))
(c)   (p ∧ ¬q) ∧ (¬p ∨ q)
(d)   ((¬p ∧ q) ∧ (q ∧ r)) ∧ ¬q
(e)   (¬p ∨ q) ∨ (p ∧q)

46. Consider the statement, "Either −2 ≤ x ≤ −1 or 1 ≤ x ≤ 2." The negation of this statement is
(a)   x < −2 or 2 < x or −1 < x < 1
(b)   x < −2 or 2 < x
(c)   −1 < x < 1
(d)   −2 < x < 2
(e)   x ≤ −2 or 2 ≤ x or −1 < x < 1

47. The truth table for a Boolean expression is specified by the correspondence (P,Q,R) → S where (0, 0, 0) → 0, (0, 0, 1) → 1, (0, 1, 0) → 0, (0, 1, 1) → 1, (1, 0, 0) → 0, (1, 0, 1) →0, (1, 1, 0) → 0, (1, 1, 1) → 1. A Boolean expression having this truth table is
   (a)   [(¬P ∧ ¬Q) ∨ Q] ∨ R
   (b)   [(¬P ∧ ¬Q) ∧ Q] ∧ R
   (c)   [(¬P ∧ ¬Q) ∨ ¬Q] ∧ R
   (d)   [(¬P ∧ ¬Q) ∨ Q] ∧ R
   (e)   [(¬P ∨ ¬Q) ∧ Q] ∧ R

48. Which of the following statements is FALSE?
   (a)   (P ∧ Q) ∨ (¬P ∧ Q) ∨ (P ∧ ¬Q) is equal to ¬Q ∧ ¬P
   (b)   (P ∧ Q) ∨ (¬P ∧ Q) ∨ (P ∧ ¬Q) is equal to Q ∨ P
   (c)   (P ∧ Q) ∨ (¬P ∧ Q) ∨ (P ∧ ¬Q) is equal to Q ∨ (P ∧ ¬Q)
   (d)   (P ∧ Q) ∨ (¬P∧Q) ∨ (P∧¬Q) is equal to [(P ∨ ¬P) ∧ Q] ∨ (P ∧ ¬Q)
   (e)   (P ∧ Q) ∨ (¬P ∧ Q) ∨ (P ∧¬Q) is equal to P ∨ (Q ∧ ¬P).

49. To show that the circuit corresponding to the Boolean expression (P ∧Q) ∨(¬P ∧Q) ∨(¬P ∧ ¬Q) can be represented using two logical gates, one shows that this Boolean expression is equal to ¬P ∨Q. The circuit corresponding to (P ∧ Q∧R) ∧ (¬P ∧Q∧ R) ∨ (¬P ∧ (¬Q ∨ ¬R) computes the same function as the circuit corresponding to
   (a)   (P ∧ Q) ∨ ¬R
   (b)   P ∨ (Q ∧ R)
   (c)   ¬P ∨ (Q ∧ R)
   (d)   (P ∧ ¬Q) ∨ R
   (e)   ¬P ∨ Q ∨ R

50. Using binary arithmetic, a number y is computed by taking the n-bit two's complement of x − c. If n is eleven, x = 101000010012 and c = 101012 then y =
   (a)   011000011112
   (b)   011000011002
   (c)   011000111002
   (d)   010001111002
   (e)   011000000002

Ans.   (1)(b), (2)(a), (3)(b), (4)(c), (5)(e), (6)(d), (7)(a), (8)(c), (9)(b), (10)(c), (11)(b), (12)(b), (13)(a), (14)(d), (15)(b), (16)(a), (17)(d), (18) (a), (19)(a), (20)(a), (21)(c), (22)(d), (23)(b), (24)(d), (25)(c), (26)(d), (27)(c), (28)(b), (29)(c), (30)(a), (31)(a), (32)(a), (33)(b), (34)(c), (35)(b), (36)(b), (37)(a), (38)(d), (39)(a), (40)(b), (41)(c), (42)(a), (43)(d), (44)(e), (45)(b), (46)(a), (47)(d), (48)(a), (49)(c), (50)(b),

(c)   Fill in the Blanks:

1   Every chain is a _____.
2   Every lattice has _____maximal and minimal element.
3   Every equivalence relation is _____ , _____ and_____.
4   If a poset (S,R) is a lattice then the dual poset (S, R⁻¹)is also a _____

5   _____ many different Boolean functions are there of degree 7.

6   The proposition (p∧q) ∧-(pVq) is a _____.

7   According to Distributive Law pV(q∧r)=_____.

Ans.   (1)(lattice), (2)(unique), (3)(reflexive, symmetric, transitive), (4)(lattice), (5)(2^{128})
(6)(contradiction), (7)(pVq)∧(p∧r).

II   Short Answer Type Questions:

1   Answer these questions for the partial order represented by this Hasse diagram.
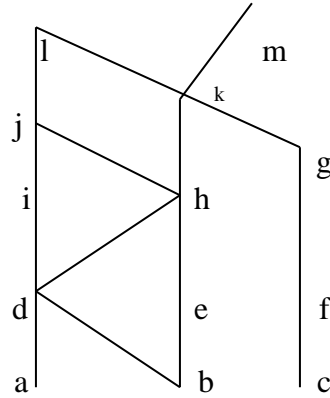
(a)   Find the maximal element.
(b)   Find the minimal element.
(c)   Is there a greatest element.
(d)   Is there a least element
(e)   Find all the upper bounds of {a, b, c}.
(f)   Find the least upper bound of {a, b, c}, if it exists
(g)   Find all lower bounds of {f, g, h}, if it exists

Ans.   (a)   {l,m}
        (b)   {a,b,c}
        (c)   No
        (d)   No
        (e)   {k.l.m}
        (f)   k
        (g)   does not exist

2   Determine whether the posets with these Hasse diagrams are lattices.
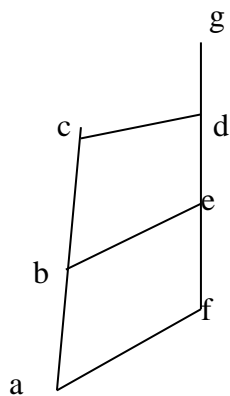
(A)
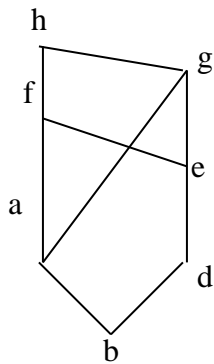
(B)
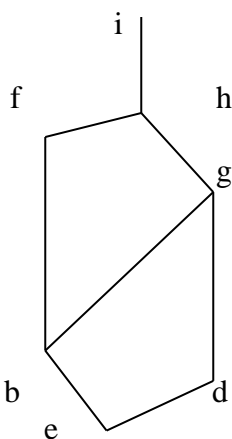
(C)

Ans.   (A) and (C) are lattices.

3   Show that lexicographic order in a partial ordering on the Cartesian products of two posets.

Determine whether these posets are lattices (4-7):

4      $(\{1,3,6,9,12\}, |)$
5      $(\{1,5,25, 125\}, |)$
6      $(Z, \geq)$
7      $(P(S), \supset)$, where $P(S)$ is the power set of a set S.
Ans.   4), 5) and 7) are lattices

8   Show that if the poset (S,R) is a lattice then the dual poset (S, R^{-1}) is also a lattice.
9   Is he poset $(Z^+, |)$ a lattice?
10   Show that every non empty subset of a lattice has al.u.b& a. g. l. b.
11   Give an example of an infinite lattice with
       (a)   neither a least nor a greatest element
       (b)   a least but not a greatest element

     (c)   a greatest but not a least element

     (d)   both a least & a greatest element

12   what are the various properties of lattices?

13   Find the value of $1.0 + (\overline{0+1})$.

Ans.   0

14   Show that the distributive law $x(y+z) = xy + xz$ is valid.

15   Find the sum-of-products expansion for the function $F(x,y,z) = (x+y)\,\bar{z}$.

16   Determine whether the posets represented by the Hasse diagram are lattices:
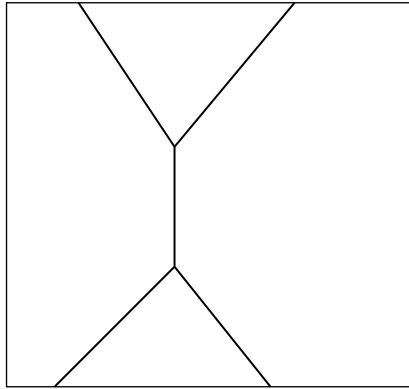
Ans   No

17   In Boolean algebra if a+b=1, and a.b=0, show that the complement of every a is unique.

18   Let D_{105} be the set of all divisors of D_{105}. Draw a Hasse diagram of lattice D_{105}.

19   Show that D_{20} is not a finite Boolean algebra with the partial order of divisibility.

20   Does the following Hasse diagram represent a lattice? Give reason.
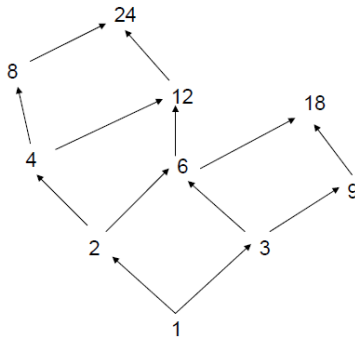
21   The set P ({a,b,c}) is partially ordered with respect to subset relation. Find a chain of length 3 in P.

22   Find the solution of the recurrence relation $a_n = 3\,a_{n-1} + 1$ where $a_0 = 1$.

23   Find the particular solution for the following recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 3^n$.

24   For any positive integer n, let In{ x 1 x n} $=\,\leq\,\leq$. Let the relation "divides" be written as a b iff a divides b or b = ac for some integer c. Draw the Hasse diagram and determine whether [I;<] is a lattice.

25   Prove the following Boolean expression:

$(x \vee y) \wedge (x \vee \sim y) \wedge (\sim x \vee z) = x \wedge z$

26   Let L be a lattice then for every a and b in L

$a \vee b = b$ if and only if $a \leq b$

27   Let L, be distributive Lattice, for any any a, b, c $\in$ L, then show that

$a \wedge b = a \wedge c$ and $a \vee b = a \vee c$ imply $b = c$

28   The set P ({a,b,c}) is partially ordered with respect to the subset relation. Find a chain of length 3 in P.

29   Show that D_{20} is not a finite Boolean algebra with the partial order of divisibility

30   Find the solution of recurrent relation $a_n = 3a_n + 1$ where $a_0 = 1$.

III   Long Answer Type Questions:

1   Every finite nonempty poset (S,$\leq$) has at least one minimal element.

2   Show that lexicographic order is a partial ordering on the Cartesian products of two posets.

3   Show that there is exactly one maximal element and minimal element in a poset with a greatest and least element respectively.

4   Show that the poset(Z, $\leq$) , ahere x<y if and only if $|x|<|y|$ is a well-founded but no a totally ordered set.
    (A poset (R, $\leq$) is well-founded if there is no infinite decreasing sequence of elements in the poset, that is, elements $x_1, x_2, \ldots\ldots x_n$ such that $\ldots.. < x_n < \ldots < x_2 < x_1$)

5   Give a example of a poset that has
    a)   a minimal element but no maximal element.
    b)   a maximal element but no minimal element.
    c)   neither a maximal nor a minimal element.

6   Give example of infinite lattice with
    a)   neither a least nor a greatest element.
    b)   a least but not a greatest element.
    c)   a greatest but not a least element.
    d)   Both a least and a greatest element.

7   Prove Distributive law , De Morgan's law, Associative law, Commutative law for lattices.

Use K-maps to minimize following sum of products expansions (8-13):

8   xyz' + xy'z' + x'yz + x'y'z'.

9   xy'z + xy'z' + x'yz + x'y'z +x'y'z'.

10   xyz + xyz' + xy'z + xy'z' + x'yz + x'y'z + x'y'z'.

11   xyz' + xy'z' + x'y'z + x'y'z'

12   wxyz + wxyz' + wxy'z' + wx'yz + wx'y'z + wx'y'z' + w'xy'z + w'x'yz + w'x'yz'

13   wxy'z'+ wx'yz+ wx'yz'+ wx'y'z+ w'xy'z'+ w'x'yz'+ w'x'y'z'.

Ans.

8. xz'+y'z'+x'yz
9. y'+x'z
10. x+y'+z
11. xz'+x'y'
12. wyz+wxz'+wx'y'+w'x'y+w'xy'z
13. y'z'+wx'y+x'z'

Use Quine- McCluskey Method to minimize following sum of products expansions (14-19):

14 xyz' + xy'z' + x'yz + x'y'z'.
15 xy'z + xy'z' + x'yz + x'y'z +x'y'z'.
16 xyz + xyz' + xy'z + xy'z' + x'yz + x'y'z + x'y'z'.
17 xyz' + xy'z' + x'y'z + x'y'z'.
18 wxyz + wxyz' + wxy'z' + wx'yz + wx'y'z + wx'y'z' + w'xy'z + w'x'yz + w'x'yz'
19 wxy'z'+ wx'yz+ wx'yz'+ wx'y'z+ w'xy'z'+ w'x'yz'+ w'x'y'z'.

Ans.
14. xz'+y'z'+x'yz
15. y'+x'z
16. x+y'+z
17. xz'+x'y'
18. wyz+wxz'+wx'y'+w'x'y+w'xy'z
19. y'z'+wx'y+x'z'

20 Consider a game in which two players take turns removing any positive number of matches they want from one of the two piles of matches. The player who removes the last match wins the game. Show that if two piles contain the same number of matches initially, the second player can always guarantee a win.

21 Give a recursive definition of a^n, where a is a nonzero real number and n is a nonnegative integer.

22 Solve the following recurrence relations.
    (a) $a_n = a_{n-1} + 3$, $a_1 = 2$
    (b) $p_n = a - \underline{b}\ p_{n-1}$
                    k
    (c) $a_n = 5a_{n-1} - 6a_{n-2}$
           $a_0 = 7$, $a_1 = 16$

Ans. (i) $a_n=2+3(n-1)$
     (ii) $\underline{b}<1$
            k

$$\left(\frac{-b}{k} \right)\left(\frac{-ak+p_0}{k+b} \right)$$

$\underline{b} = 1$, p_n oscillated between p_0 and p_1
k

$\underline{b} > 1$, the difference between successive prices increases.
k

(iii)　$a_n = 5 \cdot 2^n + 2 \cdot 3^n$ for n=0,1,2,3,…..

Prove that $\forall x(P(x) \rightarrow (Q(y) \wedge R(x))), \exists x P(x) \Rightarrow Q(y) \wedge \exists x(P(x) \wedge R(x))$.

23　With out constructing the truth tables, find the principle disjunctive normal forms of the following statements $p \wedge 7(q \wedge r) \vee (p \rightarrow q)$.

24　If R is a relation on the set of integers such that (a,b)∈R, if and only if 3a+4b=7n for some integer n, prove that R is an equivalence relation.

25　Determine the number of integer solutions of the equation $X_1 + X_2 + X_3 + X_4 = 32$, $X_i \geq 0$, $1 \leq i \leq 4$. **Ans**:6545

26　Prove that $D_{42} \equiv \{S_{42}, D\}$ is a complemented lattice by finding the complement of all the elements, Where S_{42} is the set of all divisor of the positive integer 42 and D is the relation of division.

27　In the Boolean Algebra, show that $(a+b')(b+c')(c+a') = (a'+b)(b'+c)(c'+a)$

28　Find the minimum of the following Boolean function $f(a,b,c) = \sum(0,1,2,3,5,7)$

29　Solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + (n+1)2^n$

30　Let $L, \leq$ be a bounded distributive lattice with 1 and 0 as unit and zero elements of L respectively. (i) Prove the Demorgan's Law. (ii) Show that if the complement of an element in L exists then it is unique.

31　Minimize the Boolean expression $F = A'C + A'B + AB'C + BC$

32　If lattices $L_1, \leq 1$ and $L_2, \leq 2$ are lattices, show that $L_1 x L_2, \leq$ is also lattice.

33　Minimize the Boolean expression $f(x,y,z,w) = \sum(0,3,4,5,7)$ and $d(x,y,z,w) = \sum(8,9,10,11,12,13,14,15)$.

34　Show that every finite lattice has a least upper bound and a greatest lower bound.

35　Simplify the Boolean function $F(a,b,c,d) = \sum(0,1,2,3,4,5,7,6,8,9,11)$.

36　Minimize the following sum of product expansion: $xy\bar{z} + x\bar{y}\bar{z} + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z}$.

37　Find solution of the recurrence relation, $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$. For n≥2.

38   Solve the difference equation $a_r - 5a_{r-1} + 6a_{r-2} = 2^r + r$, for r >=2 with the boundary conditions $a_0 = 1$ and $a_1 = 1$

39   Let L_1 be the lattice D_6 (divisor of 6) = {1, 2, 3, 6} and let L_2 be the lattice (P(S), ⊆) where S = {a,b}. Show that two lattices are isomorphic.

40   Simplify $y = \sum m$ (0,1,2,3,4,6,8,9,10,11,12,14) using K-map.

41   Compute f(n) when n = 2^k, where f satisfies the recurrence relation f(n) = 8f(n/2) + n^2 with f(1) = 1.

42   Prove that (A, ≤), where A = {x|0 < x < 1} and is usual partial order of "less than or equal to" is unbounded lattice. Also show that (A, ≤) is of finite length.

      Simplify the following Boolean functions-
43   F = x'yz + x'yz' + xy'z' + xy'z.
44   F = x'yz + xy'z' + xyz + xyz'.
45   Let the sets S0, S1, S2……S7 be given by-
      S_0 = {a,b,c,d,e,f}, S_1 = {a,b,c,d,e,}, S_2 = {a,b,c,e,f},S_3 = {a,b,c,e},S_4 = {a,b,c},S_5 = {a,b},S_6 = {a,c},S_7 = {a}
      Draw the diagram of < L,   > where L = {S0, S1, S2….S7}. Give the operations of meet and join.
46   Solve the recurrence equation f_n= $2f_{n-1}$ + (n-1); f_1 = 12.
47   Let (L, ≤) *be* a bounded distributive lattice with 1 and 0 as unit and zero elements of L respectively.
48   (i)   Prove the DeMorgan's Law
      (ii)   Show that if the complement of an element in L exists then it is unique.
49   Simplify $y = \sum m$ (0,1,2,3,4,6,8,9,10,11,12,14) using k-map
50   Let L L_1 be the lattice D_6 (dividor of 6) = {1,2,3,6} and let L L_2 be the lattice (P(S), ⊆) where S = {a,b}. Show that two lattices are isomorphic
51   Minimize the Boolean expression $f(x,y,z,w) = \sum (0,3,4,5,7)$ and $d(x,y,z,w) = \sum (8,9,10,11,12,13,14,15)$

UNIT - III

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   (Z,+,*)is a commutative group.
2   S_3 is a cyclic group
3   Let H be a subgroup of a finite group G .Then the order of H divides the order of G.
4   The prime factorization of 100, 641, 999 and 1024 are $2^2 . 5^2$, 641, $3^3.37$ and 2^{10}.

5   The greatest common divisor of 24 and 36 is 14.

6   The integers a and b are relatively prime if their greatest common divisor is 2.
7   If A = {1,2,3,4,5,6} then the cycles (1,2,5) and (3,4,6) are disjoint, whereas (1,2,5) and (2,4,6) are not.
8   Every group of order 6 is cyclic.
9   Every element of the symmetric group S_5 can be written as a product of disjoint transpositions.
10   Every subgroup of an abelian group is normal.
11   For x in a group G, if $x^6 = e$, then $o(x) = 6$.
12   Every group of order 13 is cyclic.
13   For a, b ∈ Z, if there exist x, y ∈ Z such that ax + by = 5 then gcd(a, b) = 5.
14   The congruence 11x ≡ 14 mod 35 is solvable. True False NA c. The congruence 15x ≡ 6 mod 18 has 3 solutions modulo 18. True False NA d. If ax ≡ 1 mod b has a solution, then bx ≡ 1 mod a has a solution. True False NA e. For a, b, c ∈ Z, if a|c and b|c, then (a + b)|c

Ans.   (1)(T), (2)(F), (3)(T), (4)(T), (5)(F), (6)(F), (7)(T), (8)(F), (9)(F), (10)(T), (11)(F), (12)(T), (13)(F), (14)(F), (15)(T)

(b)   Multiple Choice Questions:

1   A group of this order is NOT guaranteed to be Abelian.
        (a)   125
        (b)   169
        (c)   9
        (d)   5

2   What group can be written as: (123), (132), (213), (231), (312), (321)?
        (a)   D6
        (b) S_3
        (c) C_3XC_3
        (d) A_6

3   A group of order 150 cannot have a subgroup of this order.
        (a)   6
        (b)   1
        (c)   8
        (d)   5

4   Encryption of message STOP using RSA cryptosystem with p = 43 and q = 59 so that n = 43.59 = 2537 and with e = 13. Note that
        gcd(e, (p-1)(q-1)) = gcd(13,42.58) = 1
        (a)   1189   1415
        (b)   1819   1145
        (c)   1819   1415
        (d)   1118   1451

5   We receive the encrypted message 0981 0461. What is the decrypted message if it is encrypted using RSA cipher from above question?
(a) HPEL
(b) HELP
(c) HLEP
(d) HPLE

6   Which of the following is a unit in Z39?
(a)   24
(b)   25
(c)   26
(d)   27

7   Which of the following is a zero-divisor in Z225?
(a)   34
(b)   44
(c)   50
(d)   61

8   What is the negation of the following statement?
$\forall x \in R \; x.1 = x$
(a) $\forall x \in R, \; x.1 \, 6= x$
(b) $\exists x \in R \; s.t. \; x.1 \, 6= x$
(c) $\exists x \in R \; s.t. \; x.1 = x$
(d) $\forall x \, 6\in R \; x.1 \, 6= x$

9   In the symmetric group S5. How many elements are there in the conjugacy class of the element (12)(34)?
(a)   60
(b)   15
(c)   24
(d)   30

10   What is the order of the dihedral group D6, the group of symmetries of a regular hexagon?
(a)   360
(b)   720
(c)   6
(d)   12

11   What is the order of the alternating group A2?
(a)   1
(b)   2
(c)   3
(d)   4

12   What is the order of the element a5 in the cyclic group of order 11 generated by a?

(a)   5
(b)   6
(c)   11
(d)   30

13   What is the class equation of a cyclic group of order 6?
(a) $1 + 1 + 1 + 1 + 1 + 1 = 6$
(b) $1 + 1 + 1 + 1 + 2 = 6$
(c) $1 + 1 + 2 + 2 = 6$
(d) $1 + 2 + 3 = 6$

14   What is the class equation of S3?
(a) $1 + 1 + 1 + 1 + 1 + 1 = 6$
(b) $1 + 1 + 1 + 1 + 2 = 6$
(c) $1 + 1 + 2 + 2 = 6$
(d) $1 + 2 + 3 = 6$

15   What is the class equation of D4?
(a) $2 + 2 + 2 + 2 = 8$
(b) $1 + 3 + 6 + 6 + 8 = 24$
(c) $1 + 2 + 4 = 8$
(d) $1 + 1 + 2 + 2 + 2 = 8$

16   What is the order of the quotient group S3/A3?
(a)   2
(b)   3
(c)   6
(d)   12

17   Let Z be the group of all integers under the operation of addition. Which of the following subsets of Z is not a subgroup of Z?
(a) $\{0\}$
(b) $\{n \in Z: n \geq 0\}$
(c) $\{n \in Z: n$ is an even interger$\}$
(d) $\{n \in Z: n$ is divisible by both 6 and $9 \geq 0\}$
(e)   Z

18   A cyclic group of order 15 has an element x such that the set $\{x3, x5, x9\}$ has exactly two elements. The number of elements in the set $\{x13n: n$ is a positive integer$\}$ is
(a)   3
(b)   5
(c)   8
(d)   15
(e)   Infinite

19   A group of this order is NOT guaranteed to be Abelian.
(a)   125

(b)   169
(c)   9
(d)   5

20   What group can be written as: (123), (132), (213), (231), (312), (321)?
(a)   D6
(b)   S3
(c)   C3XC3
(d)   A6

21   A group of order 150 cannot have a subgroup of this order.
(a)   6
(b)   1
(c)   8
(d)   5

22   Any subgroup H of an abelian group is a _____ group.
(a)   Normal
(b)   Abelian
(c)   Unique
(d)   None of these

23   Identity and inverse of any element of a group is _____.
(a)   Normal
(b)   Abelian
(c)   Unique
(d)   None of these

24   A group is said to be _____ if the commutative law holds.
(a)   Normal
(b)   Abelian
(c)   Unique
(d)   None of these

25   (Z,+,*)is a commutative group.
(a)   True
(b)   False
(c)   Neither true nor false
(d)   None of these

26   GCD (72, 63) is
(a)   9
(b)   21
(c)   7
(d)   None of these

27   The greatest common divisor of 27 and 72 is
        (a)   27
        (b)   9
        (c)   1
        (d)   None of these

28   Find the multiplicative inverse of 17 in Z*64
        (a)   49
        (b)   7
        (c)   21
        (d)   None of these

29   A group of objects can be arranged in 3 rows leaving 2 left, in 5 rows leaving 4 left,
        and in 7 rows leaving 6 left. How many objects are there?
        (a)   102+103K
        (b)   104 + 105 k
        (c)   105+104K
        (d)   None of these

30   Express 355253/379231 in the lowest terms
        (a)   563/601
        (b)   463/601
        (c)   601/563
        (d)   None of these
31   If the finite group G contains a sub-group of order seven but no element (other than the
        identity) is its own inverse, the order of G could be
        (a)   26
        (b)   28
        (c)   35
        (d)   42
32   Let (G,*) be a group and (H,*) be a subgroup of (G,*). Then for any a * G, Ha is called
        (a)   Left coset of H in G
        (b)   Right coset of H in G
        (c)   Subset of G
        (d)   G

33   In a finite group (G,*), the order of every subgroup (H,*) ………. the order of (G,*)
        (a)   Subtracts
        (b)   Adds to the
        (c)   Divides
        (d)   Is multiple of

34   What is the identity element for a group (Z,+)
        (a)   0

(b)   1

(c)   -1

(d)   All of the above

35   If a group does not have identity element then we call the group as

(a)   Uadragropu

(b)   Monoid

(c)   Commutative

(d)   Associate

36   What is the order of the first non-abelian group

(a)   1

(b)   2

(c)   4

(d)   6

37   Let (H,.) and (k,.) are two subgroups of a group (g,.). Which of the statement below is true

(a) $(H \cap K, .)$ is a group

(b) $(H \cup K, .)$ is a group

(c)   both are true

(d)   none of these

38   Let (G,.) be group with order n . What will be the possible order of the subgroups

(a)   divisors of n

(b)   n-1

(c)   n/2

(d)   all of the above

39   Let L be the least common multiple of 175 and 105. Among all of the common divisors x>1 of 175 and 105, let D be the smallest. Which is correct of the following:

(a)   D = 5 and L = 1050

(b)   D = 5 and L = 35

(c)   D = 7 and L = 525

(d)   D = 5 and L = 525

(e)   D = 7 and L = 1050

40   The Euclidean Algorithm is used to produce a sequence $X1 > X2 > X3 > X4 > X5 = 0$ of positive integers where $Xt = qt+1Xt+1 + Xt+2$, t = 1, 2, 3. The quotients are q2 = 3, q3 = 2, and q4 = 2. Which of the following is correct?

(a)   gcd(X1,X2) = −2X1 + 6X2

(b)   gcd(X1,X2) = −2X1 −6X2

(c)   gcd(X1,X2) = −2X1 −7X2

(d)   gcd(X1,X2) = 2X1 + 7X2

(e)   gcd(X1,X2) = −2X1 + 7X2

41   If n is a positive integer, then the remainder when $n \in N$ is divided by 7 is

(a)   3
(b)   0
(c)   5
(d)   4
(e)   None of these

42.   If $n \in N$ then $n^{13} - n$ is always divisible by

(a)   13
(b)   16
(c)   15
(d)   14
(e)   None of these

43.   Which of the following is a multiple of 5, $\forall n \in N$

(a) $n^6 - n^2 + 10$
(b) $n^5 - n - 25$
(c) $n^{13} - n^{15} + 35$
(d) None of the above

44   Which of the following statements is true:
(a)   A number k divides the sum of three consecutive integers n, n + 1, and n + 2 if
        and only if it divides the middle integer n + 1.
(b)   An integer n is divisible by 6 if and only if it is divisible by 3.
(c)   For all integers a, b, and c, a | bc if and only if a | b and a | c.
(d)   For all integers a, b, and c, a | (b + c) if and only if a | b and a | c.
(e)   If r and s are integers, then r | s if and only if r2 | s2.

45   For all N ≥ 0, if N = k(k + 1)(k + 2) is the product of three consecutive non-negative
        integers then for some integer s > k, N is divisible by a number of the form
(a)   s2 − 1
(b)   s2 − 2
(c)   s2
(d)   s2 + 1
(e)   s2 + 2

46   To one percent accuracy, the number of integers n in the list 04 , 14 , 24 , . . . , 10004
        such that n% 16 = 1 is
(a)   20 percent
(b)   50 percent
(c)   30 percent
(d)   35 percent

(e)   25 percent

47   Which of the following statements is TRUE:
(a) For all odd integers n, $\lfloor n/2 \rfloor = (n+1)/2$
(b) For all real numbers x and y, $\lfloor x + y \rfloor = \lfloor x \rfloor + \lfloor y \rfloor$.
(c) For all real numbers x, $\lfloor x^2 \rfloor = (\lfloor x \rfloor)^2$.
(d) For all real numbers x and y, $\lceil x + y \rceil = \lceil x \rceil + \lceil y \rceil$.
(e) For all real numbers x and y, $\lfloor xy \rfloor = \lfloor x \rfloor \lfloor y \rfloor$.

48   Which of the following statements is logically equivalent to the statement, "If a and b $\neq 0$ are rational numbers and r $\neq 0$ is an irrational number, then a+br is irrational."
(a)   If a and b $\neq 0$ are rational and r $\neq 0$ is real, then a + br is rational only if r is irrational.
(b)   If a and b $\neq 0$ are rational and r $\neq 0$ is real, then a + br is irrational only if r is irrational.
(c)   If a and b $\neq 0$ are rational and r $\neq 0$ is real, then r is rational only if a + br is rational.
(d)   If a and b $\neq 0$ are rational and r $\neq 0$ is real, then a + br is rational only if r is rational.
(e)   If a and b $\neq 0$ are rational and r $\neq 0$ is real, then a + br is irrational only if r is rational.

49   The number of primes of the form $|n^2 - 6n + 5|$ where n is an integer is
(a)   0
(b)   1
(c)   2
(d)   3
(e)   4

50   The Euclidean Algorithm is used to produce a sequence $X_1 > X_2 > \cdots > X_{k-1} > X_k = 0$ of positive integers where each X_t, $2 < t \leq k$, is the remainder gotten by dividing X_{t-2} by X_{t-1}. If $X_{k-1} = 45$ then the set of all (positive) common divisors of X_1 and X_2 is
(a)   {1, 3, 5}
(b)   {1, 3, 5, 9, 15, }
(c)   {1, 9, 15, 45}
(d)   {1, 3, 5, 15}
(e)   {1, 3, 5, 9, 15, 45}

Ans.   (1)(d), (2)(b), (3)(c), (4)(c), (5)(b), (6)(a), (7)(b), (8)(b), (9)(b), (10)(c), (11)(b), (12)(c), (13) (b), (14)(d), (15)(a), (16)(a), (17)(b), (18)(a), (19)(d), (20)(b), (21)(c), (22)(a), (23)(c), (24)(b), (25)(a), (26)(a), (27)(b), (28)(a), (29)(b), (30)(a), (31)(c), (32)(b), (33)(c), (34)(a), (35)(b), (36)(a), (37)(a), (38)(a), (39)(d), (40)(e), (41)(e), (42)(e), (43)(b), (44)(e), (45)(a), (46)(b), (47)(a), (48)(d), (49)(c), (50)(e).

(c)   Fill in the Blanks:

1   Any subgroup H of an abelian group is a _____ group.
2   Identity and inverse of any element of a group is _____.
3   A group is said to be _____ if the commutative law holds.
4   A subgroup $\langle H, * \rangle$ of $\langle G, * \rangle$ is called a _____ if for any $a \in G$, $aH = Ha$.
5   Let $\langle H, * \rangle$ be a subgroup of $\langle G, * \rangle$. The set of _____ of H in G forms a partition of G. Every element of G belongs to one and only one _____ of H.
6   Value if x and y such that $71x - 50y = 1$ are _____ and _____.

Ans.   (1)(normal), (2)(unique), (3)(abelian), (4)(normal subgroup), (5)(left coset, left coset), (6)(x = 31, y = 44)

II   Short Answer Type Questions:

Let E denote the set {......,-6,-4,-2,0,2,4,6,......} of even integers, let + and _ denote the usual arithmetic operations of addition and multiplication respectively, and let # denote the binary operation on E defined by x # y = 1/2xy for all even integers x and y.
1   Is (E; +) a monoid?
2   Is (E;_) a monoid?
3   Is (E; #) a monoid?
[Briefly justify your answers.]

Ans.   (1)Yes   (2)Yes   (3)No

X denote the set {. . . ,−5,−3,−1, 1, 3, 5, . . .} of odd integers, and let # denote the binary operation on X defined by x # y = 12 (xy − x − y + 3) for all odd integers x and y.

4   Is (X, #) a monoid? If so, what is its identity element?
5   Is (X, #) a group?
[Briefly justify your answers.]

Ans.   (4)No (5)No

6   Let C be a cyclic group and let D is a subgroup of C. Show that D is cyclic.
7   Show that every cyclic group of order n is isomorphic to the group $(z_n, +n)$.
8   Show that $\sqrt{3}$ is not a rational number.
9   find the remainder when the sum 1! + 2! + 3!+ …..+ 99! + 100! is divided by 12.
10   State cayley's theorem with proper example.
11   If permutation of the elements are given by{1,2,3,4,5}are given by α=
$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix}$, β=$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$ then find αβ.
12   What are applications of number theory in computer science?

13   Let (G,.) be a group. Prove that $(xy)^{-1} = y^{-1}x^{-1}$.
14   State Fermat's Little theorem.
15   Prove or Disprove that AUB is a group, where A and B are groups.
16   Prove that if gcd(a,b) = 1 then gcd (a^2, b^2) = 1.
17   Consider (m,3m) encoding function where m = 4. For received word 011010011111, an error will occur on not.
18   Show that any subgroup of a cyclic group is cyclic.
19   Show that every quotient group of a cyclic group is cyclic.
20   Determine the inverse element in the group (X, *), where binary operator * is defined as a*b=a+b-1 for a, b € Z.

Ans: inverse of a is (2-a).

21   Show that $g^{-1}Hg$ is a subgroup of a group G, for a subgroup H of G.
22   Show that a cyclic group is abelian.
23   Solve equation 5x + 19y = 1 to find integer values for x and y.

Ans: x = 4 & y = -1

24   Show that any subgroup of a Cyclic group is Cyclic.
25   What are applications of number theory in computer science?

III   Long Answer Type Questions:

1   Show that the kernel of a homomorphism is a normal subgroup.
2   State and prove Lagrange's Theorem.
3   State and prove the First Isomorphism Theorem.
4   State and prove the Second Isomorphism Theorem.
5   Let H be a subgroup of a group G. If x, y 2 G show that either xH ∩yH = Ø or xH = yH.
6   Show that the intersection of two normal subgroups of G is a normal subgroup of G.
7   State and prove the Third Isomorphism Theorem.
8   Let A and B be subgroups of G such that AB = BA. Show that AB is a subgroup of G.
9   Let G be a group of order n and let m be an integer relatively prime to n. Show that if $x^m = y^m$, then x = y. Hence show that for each z € G there is a unique x €G such that $x^m = z$.
10   Show that a subgroup H is normal if and only if every left coset is also a right coset.
11   Is a normal subgroup of a normal subgroup a normal subgroup? Explain.
12   What are the applications of congruences?
13   What is the difference between simple and RSA cryptosystems?
14   Show that every quotient group of a cyclic group is cyclic.
15   Show that every group of order 3 is cyclic and every group of order 4 is abelian.
16   If H is a subgroup of G such that x^2€H for every x€G, prove that H is normal subgroup of G.

17 Find the code words generated by the encoding function e:$B^2{\rightarrow}B^5$ with respect to the parity check matrix

$$H = \begin{bmatrix} O & 1 & 1 \\ O & 1 & 1 \\ 1 & O & O \\ O & 1 & O \\ O & O & 1 \end{bmatrix}$$

18 State and prove Euclid's division algorithm.

19 Explain Euclidcan algorithm to find the gcd of two nos by taking example.

20 State and prove Fermat's Little Theorem.

21 Show that in a subset H is a group (G,*) if a^*b^{-1} is in H for all a,b in H, then H is a subgroup of G.

22 Let (G,.) be a group. Let (H,.) be a subgroup of (G,.). Show that $G = H \cup Ha \cup Hb$_____ where $a, b \in G$.

23 State and prove Lagrange' theorem for groups.

24 Find the code words generated by the parity-check matrix given below

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$ When the encoding function is E: $B^3{\rightarrow} B^6$.

25 Show that if a,b are arbitrary elements of a group G, then $(ab)^2=a^2b^2$ if and only if G is abelian.

26 Let (G,*) be a group. Let H = {a| a $\in$ G and a*b = b*a for all b $\in$ G }. Show that H is a normal subgroup.

27 Is 8792002627912 a valid universal code? Explain.

28 Solve 34x = 60 (mod 98)

29 A code G contains 16 codewords: 0000000, 1111111, 1101000 and all its cyclic shifts, 0010111 and all its cyclic shifts. Show that (G ,) is a group code. Set up the coset table to show that G can correct all single transmissions.

30 Encrypt the word 'BOOK' and'PARK' using caeser cipher system f(p) = p + 3(mod 26).

31 If f is a homomorphism from a commutative semigroup (S, *) onto a semigroup(T, *'), then show that (T, *') is also commutative.

32 Let $(S, *)$ be a semigroup. Consider a finite state machine M = (S, S F), where F = {fx x $\in$S} and fx (y) = x * y for all x, y $\in$S Consider the relation R on S, x R y if and only if there is some z $\in$S such that fz (x) = y. Show that R is an equivalence relation.

33 Give an example of cyclic group of finite order. How the concept of a cyclic group is used   in developing error correcting code?

34 If G is a group in which (ab) ^{i} = a^ib^i for three consecutive integers i and any a, b in G, then show that G is an abelian group.

35 Let G be a group. If A is subgroup of G, then G/A is a group.

36 Let (G, .) be a group. Let (H, .) be a subgroup of (G, .). Show that
= $H \cup Ha$ .....$\cup Hb$, where $a, b \in G$.

37   Let (G,*) be a group. Let H = {a| a Є G and a*b = b*a for all b Є G }. Show that H is a normal subgroup.

38   Find the code words generated by the parity-check matrix given below

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

When the encoding function is E: $B^3 \rightarrow B^6$.

39   Explain Euclidean algorithm to find the g.c.d of two numbers by taking example.

UNIT - IV

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   If (t, v_0) is a rooted tree on a set A. then T is irreflexive and asymmetric.
2   The order of Tree traversal in preorder is left -> root -> right.
3   The vertex connectivity of any graph G can never exceed the edge connectivity of G.
4   The complete graph K_7 is non-planar.
5   The graph given below is bipartite.
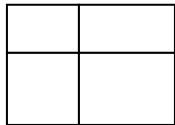
6   The cube graph Q_5 is planar.
7   A finite connected graph is Eulerian If and only if each vertex has even degree.
8   A vertex whose degree is zero is the pendant vertex.
9   A graph without edges is a null graph.
10   A graph is regular, if the degree of each vertex is same.
11   If no two edges of a graph are intersecting, then the graph is planar.
12   The number of vertices of a graph is its size.
13   The sum of degree of vertices of a graph is odd.
14   A graph with two components is a connected graph
15   A bipartite graph is two colorable.

Ans.   (1)(T), (2)(F), (3)(T), (4)(T), (5)(T), (6)(F), (7)(T), (8)(F), (9)(T), (10)(T), (11)(T), (12)(F), (13)(F), (14)(F), (15)(T)

(b)   Multiple Choice Questions:

1   The post order traversal of binary tree is
     (a)   left -> root -> right
     (b)   root -> left -> right

(c)   left -> right -> root
(d)   right -> left -> root

2   Graphs are represented in computer in which form
     (a)   Matrix
     (b)   List
     (c)   Queue
     (d)   Stack

3   If a graph can be drawn on a plane such that no two its edges intersect, that graph is
     called:
     (a)   Dual graph
     (b)   Planer graph
     (c)   Non-planer graph
     (d)   None of the above

4   A Hamiltonian cycle in a Hamiltonian graph of order 24 has
     (a)   12 edges.
     (b)   24 edges
     (c)   23 edges
     (d)   None of above.

5   A spanning tree for a simple graph of order 24 has
     (a)   12 edges
     (b)   6 edges
     (c)   23 edges
     (d)   None of above.

6   If G is a simple connected 3-regular planar graph where every region is bounded by
     exactly 3 edges, then the edges of G is
     (a)   3
     (b)   4
     (c)   6
     (d)   5

7   If G is a connected planar graph of v vertices e edges and r regions then
     (a)   v-e+r=2
     (b)   e-v+r=2
     (c)   v+e-r=2
     (d)   None of above.

8   Indicate which, if any, of the following five graphs G = (V,E, Ø), |V | = 5, is not
     isomorphic to any of the other four.

$$\phi = \begin{pmatrix} A & B & C & D & E & F \\ \{1,3\} & \{2,4\} & \{1,2\} & \{2,3\} & \{3,5\} & \{4,5\} \end{pmatrix}$$

     (a)

(b) $\phi = \begin{pmatrix} f & b & c & d & e & a \\ \{1,2\} & \{1,2\} & \{2,3\} & \{3,4\} & \{3,4\} & \{4,5\} \end{pmatrix}$ which of the following subsets

(c) $\phi = \begin{pmatrix} b & f & e & d & c & a \\ \{4,5\} & \{1,3\} & \{1,3\} & \{2,3\} & \{2,4\} & \{4,5\} \end{pmatrix}$

(d) $\phi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \{1,2\} & \{2,3\} & \{2,3\} & \{3,4\} & \{4,5\} & \{4,5\} \end{pmatrix}$

9   Indicate which, if any, of the following five graphs G = (V,E, Ø), |V | = 5, is not connected.

(a) $\phi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \{1,2\} & \{1,2\} & \{2,3\} & \{3,4\} & \{1,5\} & \{1,5\} \end{pmatrix}$

(b) $\phi = \begin{pmatrix} b & a & e & d & c & f \\ \{4,5\} & \{1,3\} & \{1,3\} & \{2,3\} & \{2,5\} & \{4,5\} \end{pmatrix}$.

(c) $\phi = \begin{pmatrix} b & f & e & d & c & a \\ \{4,5\} & \{1,3\} & \{1,3\} & \{2,3\} & \{2,4\} & \{4,5\} \end{pmatrix}$

(d) $\phi = \begin{pmatrix} a & b & c & d & e & f \\ \{1,2\} & \{2,3\} & \{1,2\} & \{1,3\} & \{2,3\} & \{4,5\} \end{pmatrix}$

10   Indicate which, if any, of the following five graphs G = (V,E, Ø), |V | = 5,have an Eulerian circuit.

$\phi = \begin{pmatrix} F & B & C & D & E & A \\ \{1,2\} & \{1,2\} & \{2,3\} & \{3,4\} & \{4,5\} & \{4,5\} \end{pmatrix}$

(a) $\phi = \begin{pmatrix} b & f & e & d & c & a \\ \{4,5\} & \{1,3\} & \{1,3\} & \{2,3\} & \{2,4\} & \{4,5\} \end{pmatrix}$

(b) $\phi = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ \{1,2\} & \{1,2\} & \{2,3\} & \{3,4\} & \{4,5\} & \{4,5\} \end{pmatrix}$

(c) $\phi = \begin{pmatrix} a & b & c & d & e & f \\ \{1,3\} & \{3,4\} & \{1,2\} & \{2,3\} & \{3,5\} & \{4,5\} \end{pmatrix}$

11   A graph with V = {1, 2, 3, 4} is described by Ø = $\begin{pmatrix} a & b & c & d & e & f \\ \{1,2\} & \{1,2\} & \{1,4\} & \{2,3\} & \{3,4\} & \{3,4\} \end{pmatrix}$ How many Hamiltonian cycles does it have?
   (a)   1
   (b)   2
   (c)   4
   (d)   16

12   A graph with V = {1, 2, 3, 4} is described by $\phi = \begin{pmatrix} a & b & c & d & e & f \\ \{1,2\} & \{1,2\} & \{1,4\} & \{2,3\} & \{3,4\} & \{3,4\} \end{pmatrix}$

It has weights on its edges given by $\lambda = \begin{pmatrix} a & b & c & d & e & f \\ 3 & 2 & 1 & 2 & 4 & 2 \end{pmatrix}$. How many minimum spanning trees does it have?
   (a)   2
   (b)   3
   (c)   4
   (d)   5

13   Define an RP-tree by the parent-child adjacency lists as follows:

(i) Root B: J, H, K; (ii) H: P, Q, R; (iii) Q: S, T; (iv) K: L, M, N.
The postorder vertex sequence of this tree is
(a) J, P, S, T, Q, R, H, L, M, N, K, B.
(b) P, S, T, J, Q, R, H, L, M, N, K, B.
(c) P, S, T, Q, R, H, L, M, N, K, J, B.
(d) P, S, T, Q, R, J, H, L, M, N, K, B.

14 Define an RP-tree by the parent-child adjacency lists as follows:
(i) Root B: J, H, K; (ii) J: P, Q, R; (iii) Q: S, T; (iv) K: L, M, N.
The preorder vertex sequence of this tree is
(a) B, J, H, K, P, Q, R, L, M, N, S, T.
(b) B, J, P, Q, S, T, R, H, K, L, M, N.
(c) B, J, P, Q, S, T, R, H, L, M, N, K.
(d) B, J, Q, P, S, T, R, H, L, M, N, K.

15 For which of the following does there exist a graph $G = (V, E, \emptyset)$ satisfying the specified conditions?
(a) A tree with 9 vertices and the sum of the degrees of all the vertices is 18.
(b) A graph with 5 components 12 vertices and 7 edges.
(c) A graph with 5 components 30 vertices and 24 edges.
(d) A graph with 9 vertices, 9 edges, and no cycles.

16 For which of the following does there exist a simple graph $G = (V, E)$ satisfying the specified conditions?
(a) It has 3 components 20 vertices and 16 edges.
(b) It has 6 vertices, 11 edges, and more than one component.
(c) It is connected and has 10 edges 5 vertices and fewer than 6 cycles.
(d) It has 7 vertices, 10 edges, and more than two components.

17 For which of the following does there exist a tree satisfying the specified constraints?
(a) A binary tree with 65 leaves and height 6.
(b) A binary tree with 33 leaves and height 5.
(c) A full binary tree with height 5 and 64 total vertices.
(d) A rooted tree of height 3, every vertex has at most 3 children. There are 40 total vertices.

18 For which of the following does there exist a tree satisfying the specified constraints?
(a) A full binary tree with 31 leaves, each leaf of height 5.
(b) A rooted tree of height 3 where every vertex has at most 3 children and there are 41 total vertices.
(c) A full binary tree with 11 vertices and height 6.
(d) A binary tree with 2 leaves and height 100.

19 The number of simple digraphs with $|V| = 3$ is
(a) 29
(b) 28

(c)   27
(d)   26
(e)   25

20   The number of simple digraphs with $|V| = 3$ and exactly 3 edges is
(a)   92
(b)   88
(c)   80
(d)   84

21   The number of oriented simple graphs with $|V| = 3$ is
(a)   27
(b)   24
(c)   21

22   The number of oriented simple graphs with $|V| = 4$ and 2 edges is
(a)   40
(b)   50
(c)   60
(d)   70

23   In each case the depth-first sequence of an ordered rooted spanning tree for a graph G is given. Also given are the non-tree edges of G. Which of these spanning trees is a depth-first spanning tree?
(a)   123242151 and $\{3, 4\}, \{1, 4\}$
(b)   123242151 and $\{4, 5\}, \{1, 3\}$
(c)   123245421 and $\{2, 5\}, \{1, 4\}$
(d)   123245421 and $\{3, 4\}, \{1, 4\}$

24    $\sum_{i=1}^{n} i^{-1/2}$ is
(a) $\Theta((\ln(n))^{1/2})$
(b) $\Theta(\ln(n))$
(c) $\Theta(n^{1/2})$
(d) $\Theta(n^{3/2})$

25   Compute the total number of bicomponents in all of the following three simple graphs, $G = (V,E)$ with $|V| = 5$. For each graph the edge sets are as follows:
$E = \{\{1, 2\}, \{2, 3\}, \{3, 4\}, \{4, 5\}, \{1, 3\}, \{1, 5\}, \{3, 5\}$ $\}$
$E = \{\{1, 2\}, \{2, 3\}, \{3, 4\}, \{4, 5\}, \{1, 3\}$ $\}$
$E = \{\{1, 2\}, \{2, 3\}, \{4, 5\}, \{1, 3\}\}$

(a)   4
(b)   5
(c)   6
(d)   7

(e)   8

26   Let b > 1. Then logb((n2)!) is
      (a) $\Theta(\log_b(n!))$
      (b) $\Theta(\log_b(2\,n!))$
      (c) $\Theta(n \log_b(n))$
      (d) $\Theta(n^2 \log_b(n))$

27   What is the total number of additions and multiplications in the following code?
      s := 0
      for i := 1 to n
      s:= s + i
      for j:= 1 to i
      s := s + j*i
      next j
      next i
      s := s+10

      (a)   n
      (b)   n2
      (c)   n2 + 2n
      (d)   (n + 1)2

28   If a graph has any vertex of degree 3 then
      (a)   It must have Euler circuit
      (b)   It must have Hamiltonian circuit
      (c)   It does not have Euler circuit

29   A vertex of degree 1 in a tree is called a
      (a)   Terminal vertex
      (b)   Internal vertex

30   Suppose that a connected planar simple graph has 30 edges. If a plane drawing of this graph has 20 faces, how many vertices does the graph have?
   (a) 12

   (b) 13

   (c) 14

31   In the following graph
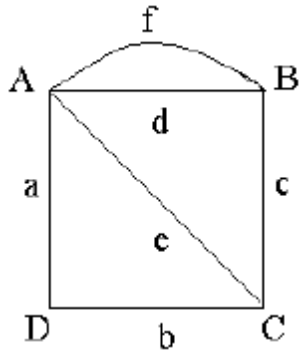
the Euler path is

(a) abcdef
(b) abcf
(c) fdceab
(d) fdeabc

32 A tree with n vertices has _____ edges

(a) n
(b) n+1
(c) n-2
(d) n-1

33 Which of the following statement is true:

(a) Every graph is not its own sub graph.
(b) The terminal vertex of a graph are of degree two.
(c) A tree with n vertices has n edges.
(d) A single vertex in graph G is a sub graph of G.

34 A graph in which all nodes are of equal degrees is known as:

(a) Multigraph
(b) Regular graph
(c) Complete lattice
(d) non regular graph

35 A binary Tree T has n leaf nodes. The number of nodes of degree 2 in T is:

(a) log n
(b) n
(c) n-1
(d) n+1

36 Suppose v is an isolated vertex in a graph, then the degree of v is:

(a) 0
(b) 1
(c) 2

(d)   3

37   In an undirected graph the number of nodes with odd degree must be
(a)   Zero
(b)   Odd
(c)   Prime
(d)   Even

38   Which of the following statement is true:
(a)   Every graph is not its own subgraph
(b)   The terminal vertex of a graph are of degree two.
(c)   A tree with n vertices has n edges.
(d)   A single vertex in graph G is a subgraph of G.

39   The length of Hamiltonian Path in a connected graph of n vertices is
(a)   n–1
(b)   n
(c)   n+1
(d)   n/2

40   A graph with one vertex and no edges is:
(a)   multigraph
(b)   digraph
(c)   isolated graph
(d)   trivial graph

41   If a graph has any vertex of degree 3 then
(a)   It must have Euler circuit
(b)   It must have Hamiltonian circuit
(c)   It does not have Euler circuit

42   A vertex of degree 1 in a tree is called a
(a)   Terminal vertex
(b)   Internal vertex

43   Suppose that a connected planar simple graph has 30 edges. If a plane drawing of this graph has 20 faces, how many vertices does the graph have?
(a)   12
(b)   13
(c)   14

44   For the given pair of graphs whether it is
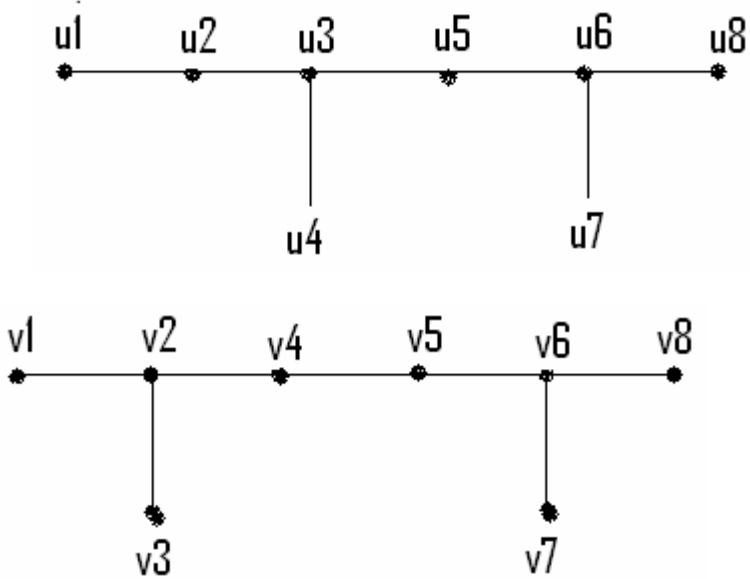
(a) Isomorphic
(b) Not isomorphic
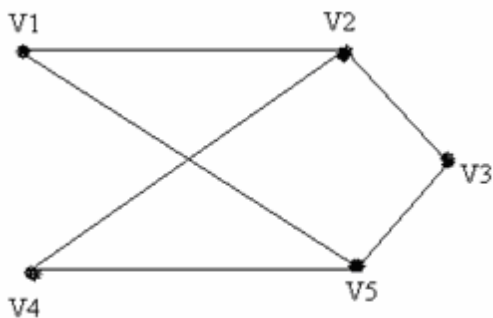
45 On the set of graphs the graph isomorphism is
   (a) Isomorphic Invariant
   (b) Equivalence relation
   (c) Reflexive relation

46 Every connected tree
   (a) does not have spanning tree
   (b) may or may not have spanning tree
   (c) has a spanning tree

47 The given graph is

(a) Simple graph
(b) Complete graph
(c) Bipartite graph
(d) Both (a) and (b)

48   Suppose that a connected planar simple graph has 15 edges. If a plane drawing of this graph has 7 faces, how many vertices does this graph have?
  (a)   Vertices-edges+faces=2
  (b)   V - 15 +7=2
  (c)   V -8 = 2
  (d)   V =10

49   A walk that starts and ends at the same vertex is called
  (a)   Simple walk
  (b)   Circuit
  (c)   Closed walk

50   Every connected tree
  (a)   does not have spanning tree
  (b)   may or may not have spanning tree
  (c)   has a spanning tree

Ans. (1)(c), (2)(a), (3)(b), (4)(b), (5)(c), (6)(c), (7)(a),(8)(a), (9)(d), (10)(d), (11)(c), (12)(b), (13)(a), (14)(b), (15)(b), (16)(d), (17)(d), (18)(d), (19)(a), (20)(d), (21)(a), (22)(c), (23)(c), (24)(c), (25)(c), (26)(d), (27)(d), (28)(c), (29)(a), (30)(a),(31)(c), (32)(d), (33)(d), (34)(b), (35)(a), (36)(a), (37)(d), (38)(d), (39)(a), (40)(d), (41)(c), (42)(a), (43)(a), (44)(a), (45)(a), (46)(c), (47)(a), (48)(b), (49)(c), (50)(c),

(c)   Fill in the Blanks:

1   The sum of the degree of the vertices of a graph G is equal to _____ the number of _____of G.
2   A finite connect6ed graph is Eulerian if and only if each vertex has_____degree.
3   A graph is said to k- regular if every vertex has degree_____.
4   G is a _____ graph with p vertices and q edges, where p≥3 if q≥3p-6.

Ans. (1)(normal),   (2)(unique),   (3)(abelian),   (4)(twice,   edges),   (5)(even),   (6)(K), (7)(connected planar)

II   Short Answer Type Questions:

1   Consider a graph with vertices a, b, c, d, e and f and edges a b, b c, c d, d a, a e, b e,   c f, d f and e f.
  (a)   Draw a diagram showing the vertices and edges of this graph.
  (b)   Is this graph regular?
  (c)   Is this graph complete?
  (d)   Does this graph have an Eulerian circuit?
  (e)   Does this graph have a Hamiltonian circuit? If so, give an example.
  (f)   Is this graph a tree?
  (g)   Does this graph have a spanning tree? If so, give an example.
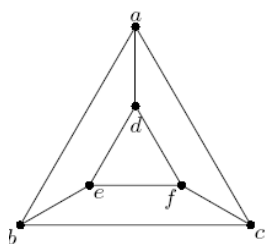   [Briefly justify all your answers above.]

Ans. (b)Yes (c)No (d)No (e)Yes (f)No (g)Yes

2   Consider the graph (representing the vertices and edges of an octohedron) which consists of 6 vertices, which we shall label as a, b, c, d, e and f, and the following 12 edges: ab, bc, cd, da, ae, be, ce, de, af, bf, cf, and df.
   (a)   Write down an incidence and adjacency matrices for this graph, where the vertices and edges are ordered as they are listed in the above specification (so that a is the first vertex, b is the second, etc., ab is the first edge, bc is the second etc.).
   (b)   Is this graph connected? [Justify your answer.]
   (c)   Is this graph complete? [Justify your answer.]
   (d)   Does this graph have an Euler circuit? If not, explain why not? If so, specify such a circuit?
   (e)   Give an example of a Hamiltonian circuit in this graph.
   (f)   Give an example of a spanning tree for this graph.

Ans.   (b)Yes   (c)No   (d)Yes

3

           Answer the following questions concerning the graph with vertices a,b, c, d, e and f pictured above. [Justify all your answers.]
   (a)   Is the graph complete?
   (b)   Is the graph regular?
   (c)   Is the graph connected?
   (d)   Does the graph have an Eulerian circuit?
   (e)   Does the graph have a Hamiltonian circuit?
   (f)   Give an example of a spanning tree for the graph, specifying the vertices and edges of the spanning tree.
   (g)   Given an example of an isomorphism between the graph pictured above and that pictured below. (You should specify the isomorphism as a function between the sets fa; b; c; d; e; fg and fu; v;w; x; y; zg of vertices of the two graphs.)
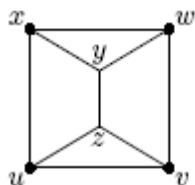
Ans.   (a)No   (b)Yes   (c)Yes   (d)No   (e)Yes

4   Complete graph has n vertices, how many edges does it have? (Justify your answer.)

5   What is chromatic number? Explain with an example.

6   Every tree with two or more vertices is 2-chromatic. Prove.

7   Write in order tree order traversal algorithm.

8   Write down the adjacency matrix of the following graph:

9   Find the incidence matrix of the graph given below:
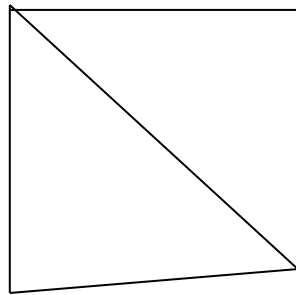
10   Give an example of a graph which contains aneulerian circuit that is also a Hamiltonian circuit.

11   Give an example of a graph which contains a Hamiltonian circuit but not a eulerian circuit.

12   Giving graphical representation discuss seven bridge problem. Was it possible for a citizen to make a tour of the city and across each bridge exactly twice? Give reasons.

13   Giving graphical representation discuss seven bridge problem. Was it possible for a citizen to make a tour of the city and across each bridge exactly twice? Give reasons.

14   Are the following graphs is isomorphic? Give reasons.
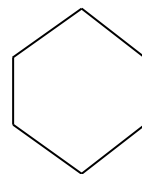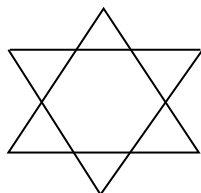
15   Prove that a tree with n vertices has n-1 edges

16   Give an example of graph having Hamiltonian circuit but not an Eulerian circuit

17   Prove that in an undirected graph numbers of odd degree vertices are even.

18   Give two ways to represent a graph in computer.

19   Define hamiltonian graph with an example.

20   Differentiate between

(i)   Graph and tree
(ii)   Subgraphs and isomorphic graphs
(iii)   Connected and complete graph

21   Show that the graphs G_1 and G_2 are homeomorphic.
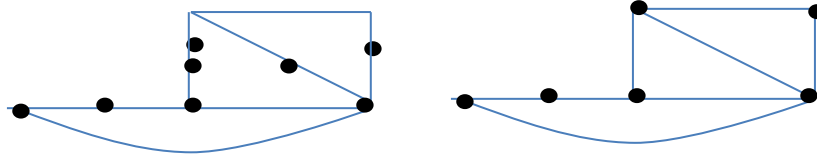
22   Show that the graph shown in figure is not Eulerian.

a   b   c

d   e   f
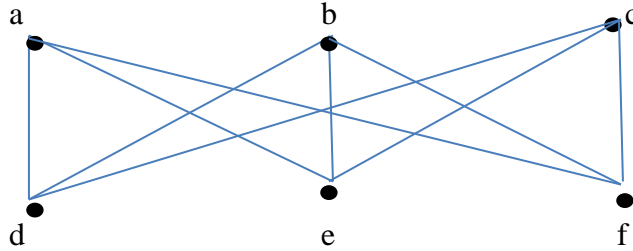
23   Show that a disconnected graph has no spanning subtree.
24   A graph G has 21 Edges, 3 vertices of degree 4 and other vertices are of degree Find
      the number of vertices in G.   Ans:13
25   How many edges are there in an undirected graph with two vertices of degree 7, four
      vertices of degree 5, and the remaining four vertices of degree is 6? Ans:29
26   Giving graphical representation discuss seven bridge problem. Was it possible for
      a Citizen to make a tour of the City and across each bridge exactly twice? Give
      reasons.

27   Define Hamiltonian graph with example.

III   **Long Answer Type Questions:**

1   Consider the following collection of graphs:

(a)   (b)   (c)   (d)
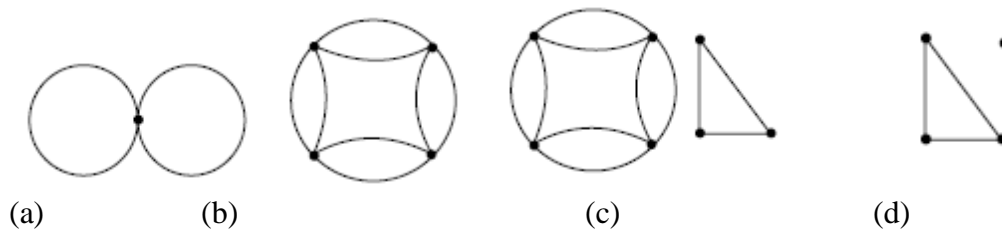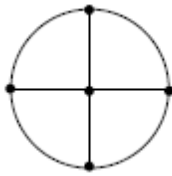
(e)   (f)   (g)   (h)
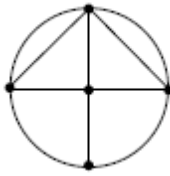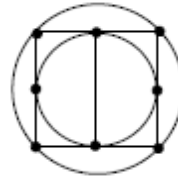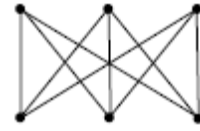
    a)   Which graphs are simple?
    b)   Suppose that for any graph, we decide to add a loop to one of the vertices.
                Does this affect whether or not the graph is Eulerian?
    c)   Which graphs are connected?
    d)   Which graphs areEulerian? Trace out an Eulerian circuit or explain why an
                Euleriancircuit is not possible.
    e)   Are there any graphs above that are not Eulerian, but have an Eulerian trail?
    f)   Give necessary conditions for a graph to be Eulerian.
    g)   Give necessary conditions for a graph to have an Eulerian trail

Ans.   (a), (d), (e), (g), (h) are simple
        (b)   No
        (c)   (a), (b), (e), (f), (g), (h) are connected
        (d)   (a), (b), (e)
        (e)   (f), (g)

2   A graph G is Eulerian if and only if it has at most one nontrivial component and its vertices all have even degree.

3   Explain Königsberg Bridge problem?

4   Let G be a directed graph (or multigraph) with V vertices and N edges. Then

$$N = \sum_{v=V} indeg(v) = \sum_{v=V} outdeg(v)$$

5   Are these two graphs isomorphic?
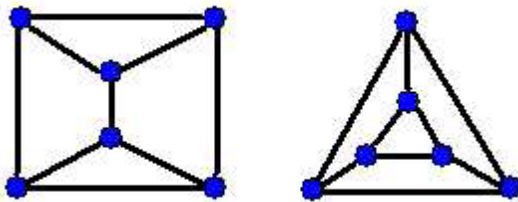
Ans.   Graphs are isomorphic

6   For any connected planar graph G =(V, E), the following formula holds
        V -F - E =2
        where F stands for the number of faces or regions .

7   Show that the component of a graph partition its vertex set.(In other words , show that every vertex belongs to exactly one component.)

8   Find minimum spanning tree of the following graph using Dijkstra's algorithm
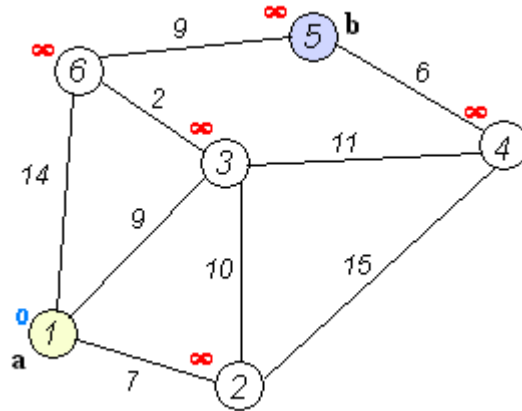
9   Explain four color and five color problem in graphs.

10 What are directed graphs? What are the different types of directed graphs.

11 Using Prim's algorithm, find minimal spanning tree from the following graph
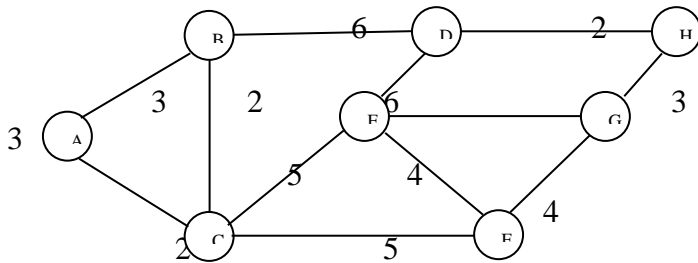
12 LetG=(V,E) be an undirected graph with edges then show that $2e = \sum deg(v)$ $v \in V$. Symbols have their own meaning. What conclusions can you draw from this result?

13 Write the steps for finding the shortest path between two vertices of a graph using Dijsktra's method. Hence find the shortest path between node A and D.
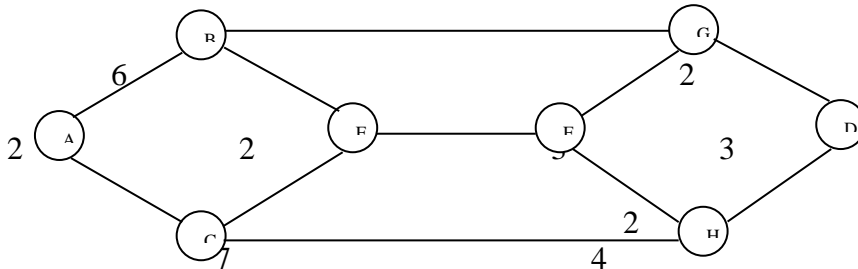
14 Show that a graph is two colorable if and only if it is a bipartite graph.

15 Euler's House. Baby Euler has just learned to walk. He is curious to know if he can walk through every doorway in his house exactly once, and return to the room he started in. Will baby Euler succeed? Can baby Euler walk through every door exactly

once and return to a different place than where he started? What if the front door is closed?
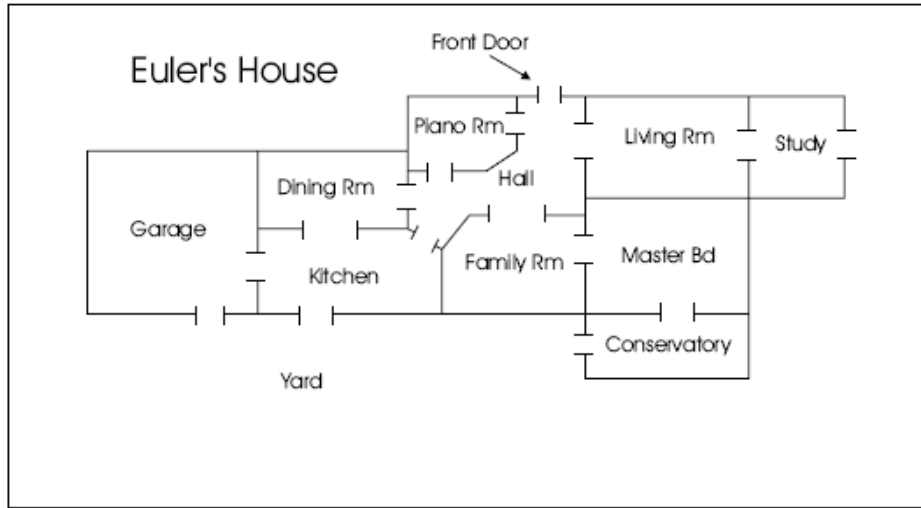
16   Prove that the number of edges in a bipartite graph with n vertices is atmost $\left\lfloor \dfrac{n^2}{2} \right\rfloor$

i.   The incidence matrices of two pairs of graphs are as follows $I_G = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$,

$$I_H = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}.$$

    Examine the isomorphism of G and H either graphically or by finding a permutation matrix.

ii.   Construct the binary tree whose in order and preorder transversal are respectively EACIFHDBC and FAEICDHGB.

iii.   Let G be a connected planar simple graph with E is number of edges and V is number of vertices and R is number of regions then V-E+R=2.

iv.   State and prove five-color theorem for graphs.

v.   Write short note on Seven Bridge Problem of graph theory.

vi.   Define pre order and post order traversal of a tree. Determine the order in which a preorder and post order traversal visits the vertices of the following ordered rooted tree.
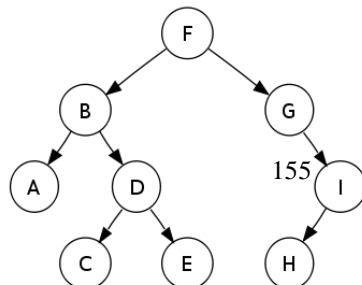
vii. Define Eulerian graph. Prove that a non empty connected graph is Eulerian if its vertices are all of even degree.

viii. Prove that a planar graph is 5-colourable.

ix. Explain inorder, preorder, and postorder tree traversals with the help of an example.

Give an account of the two matrix representations for graphs.

xi. How an Eulerian graph differs from a Hamiltonian graph? Give an example of a graph that is Eulerian but not Hamiltonian.

xii. Define degree spectrum of a graph. Prove that if all entries in the degree spectrum of a graph are even number then the graph is Eulerian.

xiii. Prove that K_6 is not a planar graph. Determine the chromatic polynomial for this graph and hence its chromatic number.

xiv. If a complete bipartite graph $K_{m, n}$ has 12 nodes and 35 edges then find the value for m and n. Draw the bipartite graph accordingly. Can we have a complete tripartite graph for the same number of nodes and edges?

30 Show that a graph is two colorable if and only if it is a bipartite graph.

31 Explain inorder, preorder and postorder tree traversals with the help of an example.

32 Let $G=(V,E)$ be an undirected graph with edges then show that $2E = \sum \deg(V), V \in V$.

33 Differentiate between
(i) Graph and tree
(ii) Subgraphs and isomorphic graphs
(iii) Connected and complete graph

QUESTION BANK

COMPUTER ORGANISATION

MCA 107

UNIT - I

I **Test Your Skills:**

(a) **State Whether the Following Statements are True or False:**

1   x + 0 = x'
2   x + y = x.y
3   OR invert and invert AND are equivalent to NOR
4   When a flip flop is used to temporarily hold data, it is sometimes called latch.
5   The characteristic equation of T flip flop is –
    $$Q(t+1) = Q(t) \oplus T$$
6    $R_2 \leftarrow R_1$ denotes transfer of content of register R_2 into R_1.
7   The transfer of information from a memory word t_2 outside environment is called write.
8   Selective complement operation complements bits in A where there are corresponding 1's in B.
9   Clear operation compares words in A and B and produces an all 0's result if two numbers are unequal.
10   Circular shift circulates the bits of the register around the two ends without loss of information.
11   AND is a universal Gate.
12   A Karnaugh's Map is an alternative representation of truth table.
13   All basic Gates can be derived from NAND Gate.
14   All basic gates can be derived from NOR Gate.
15   Karnaughs' Map helps in simplification of circuits.
16   Negative Logic represents level 1 with higher voltage than used for level 0.
17   Positive logic represents bit 0 with voltage less than that used for representing 1
18   Principle of duality allows us to construct rules involving OR from Rules involving AND
19   ax+ax' = a i.e Law of absorption is the basis of solving expression using K map.
20   K-Map becomes too complicated to use beyond five variables.

Ans.   (1)(F), (2)(F), (3)(T), (4)(T), (5)(T), (6)(F), (7)(F), (8)(T), (9)(F), (10)(T), (11)(F), (12)(T), (13)(T), (14)(T), (15)(T), (16)(F), (17)(T), (18)(T), (19)(T), (20)(T)

(b) **Multiple Choice Questions:**

1   Which of the following is a universal gate?
    (a)   AND
    (b)   OR
    (c)   NOT
    (d)   NAND

2   Which of the following codes are not reflective codes?
         (a)   8421 Code
         (b)   Excess-3 Codes
         (c)   2421 Code
         (d)   5211 Code

3   The 10's complement of decimal number 345 is
         (a)   653
         (b)   655
         (c)   654
         (d)   755

4   The inherent divide by 2 capabilities is present in which flip flop?
         (a)   T
         (b)   D
         (c)   S-R
         (d)   J-K

5   The size of PC is _____ bits
         (a)   16
         (b)   14
         (c)   32
         (d)   12

6   Floating point representation is used to store
         (a)   Boolean values
         (b)   Whole numbers
         (c)   Real integers
         (d)   Integers

7   Suppose that a bus has 16 data lines and requires 4 cycles of 250 nsecs each to transfer data. The bandwidth of this bus would be 2 Megabytes/sec. If the cycle time of the bus was reduced to 125 nsecs and the number of cycles required for transfer stayed the same what would the bandwidth of the bus?
         (a)   1 Megabyte/sec
         (b)   4 Megabytes/sec
         (c)   8 Megabytes/sec
         (d)   2 Megabytes/sec

8   (2FAOC)16 is equivalent to
         (a)   (195 084)10
         (b)   (001011111010 0000 1100)2
         (c)   Both (a) and (b)
         (d)   None of these

9   Which of the following is not a weighted code?
         (a)   Decimal Number system

(b)   Excess 3-cod
(c)   Binary number System
(d)   None of these

10   Half adder is logic CKT that adds. ………Digit at a time
(a)   two
(b)   one
(c)   three
(d)   zero

11   Half adder consists of. ……&…..Gates
(a)   EX-OR&AND
(b)   EX-OR&OR
(c)   EX-OR&NOT
(d)   None of this

12   In half adder EX-OR gate O/P is …………
(a)   Carry
(b)   Remainder
(c)   Sum
(d)   Non of this

13   In half adder AND gate O/P is …………
(a)   Carry
(b)   Reminder
(c)   Sum
(d)   None of these

14   Subtract (1010)2 from (1101)2 using 1st complement..
(a)   (1100)2
(b)   (0011)2
(c)   (1001)2
(d)   (0101)2

15   Using 2's Complement, subtraction, of (1010)2 from (0011)2 is
(a)   (0111)2
(b)   (1001)2
(c)   –(0111)2
(d)   –(1001)2

16   The full adder CKT adds. ………Digit at a time
(a)   1
(b)   2
(c)   3
(d)   4

17   Full adder is constructed by using …………….
      (a)   Two Half Adder& one OR gate
      (b)   two OR gate &one HA
      (c)   One HA & two OR gate
      (d)   One OR gate & one HA

18   ……….Are used for converting one type of number system in to other form.
      (a)   Encoder
      (b)   Logic gate
      (c)   Half adder
      (d)   FA

19   Multiplexer means …………………………
      (a)   One in to many
      (b)   many in to one
      (c)   many in to many
      (d)   none of these

20   Multiplexers is also known as.
      (a)   mux
      (b)   demux
      (c)   dder
      (d)   subtractor

21   ASCII code is a ……… bit code.
      (a)   1
      (b)   2
      (c)   7
      (d)   8

22   8421 codes is also called as.
      (a)   Gray code
      (b)   ASCII code
      (c)   excess 3-code
      (d)   BCD code

23   The decimal number is converted in to excess 3 codes by adding. to each decimal digit.
      (a)   4
      (b)   8
      (c)   2
      (d)   3

24   The binary system, 1+1=…………
      (a)   2
      (b)   0
      (c)   1

(d)   none of these

25   110+110=…………
       (a)   2
       (b)   0
       (c)   1
       (d)   none of these

26   The digital system usually operated on ………system.
       (a)   binary
       (b)   Decimal
       (c)   Octal
       (d)   Hexadecimal

27   A logic gate is an electronic circuit which
        (a)   Makes logic decisions
       (b)   Allows electron flow only in one direction
       (c)   Works on binary algebra
       (d)   Alternates between 0&1 values

28   In positive logic, logic gate 1 corresponds to
       (a)   Positive voltage
       (b)   Higher voltage level
       (c)   Zero voltage level
       (d)   Lower voltage level

29   In negative logic, the logic state 1 corresponds to
       (a)   Negative logic
       (b)   Zero voltage
       (c)   More negative voltage
       (d)   Lower voltage level

30   An X-OR gate produces an output only when it's two inputs are
       (a)   high
       (b)   Low
       (c)   Different
       (d)   Same

31.   The number of level in a digital signal is:
       (a)   One
       (b)   Two
       (c)   four
       (d)   ten

32.   A pure sine wave is :

(a)   A digital signal
(b)   Analog signal
(c)   Can be digital or analog signal
(d)   Neither digital nor analog signal

33.   The high voltage level of a digital signal in positive logic is :
(a)   1
(b)   0
(c)   Either 1 or 0

34.   A device that converts from decimal to binary numbered is called :
(a)   Decoder
(b)   Encoder
(c)   CPU
(d)   Convertor

35.   K is an abbreviation used with a number of units. Thus 2K means
(a)   2000 units
(b)   2048 units
(c)   2024 units
(d)   None of these

36.   Bit is:
(a)   Smallest piece of electronic hardware
(b)   A drilling tool
(c)   An abbreviation for binary digit
(d)   The smallest number

37.   A register is:
(a)   A group of memories
(b)   A group of devices that store digital data
(c)   A chip used in computer
(d)   A pure silica piece used in digital system

38.   A typical microcomputer has 65,536 registers in its memory. It will be specified as :
(a)   65,536 memory
(b)   65,536 K memory
(c)   64 K memory
(d)   8 K memory

39.   Nibble is :
(a)   A string of 4 bits
(b)   A string of 8 bits
(c)   A string of 16 bits
(d)   A string of 64 bits

40. The high voltage level of a digital signal in negative logic is :
    (a)   1
    (b)   0
    (c)   Either 1 or 0

41. A NOR gate is also called
    (a)   Negative AND gate
    (b)   OR inverted gate
    (c)   Both a and b
    (d)   None of the above

42. Digital signal are said to be Robust
    (a)   They don't decay
    (b)   They are noise resistant
    (c)   Both a and b
    (d)   None of these

43. _____ register keeps tracks of the instructions stored in program stored in memory.
    (a)   Address Register
    (b)   Program Counter
    (c)   Track register
    (d)   Buffer Register

44. 'Aging registers' are
    (a)   Counters which indicate how long ago their associated pages have been referenced
    (b)   Registers which keep track of when the program was last accessed.
    (c)   Counters to keep track of last accessed instruction.
    (d)   Counters to keep track of the latest data structures referred

45. A floating point number that has a 0 in the MBS of mantissa is said to have
    (a)   Overflow
    (a)   Underflow
    (b)   Important Number
    (c)   Undefined

46. Logic gates with a set of input and outputs is arrangement of
    (a)   Combinational Circuit
    (b)   Sequential Circuit
    (c)   Both a and b
    (d)   None of these

47. A k bit field can specify any of the
    (a) 3^k registers
    (b)   K Registers
    (c) K^2 Registers

(d) 2^K Registers

48.   The time interval between adjacent bits is called the
       (a)   Word-time
       (b)   Bit-time
       (c)   Turn around time
       (d)   Slice time

49.   A group of bits that tell the computer to perform a specific operation is known as
       (a)   Instruction code
       (b)   Accumulator
       (c)   Micro Operation
       (d)   Register

50.   When CPU is executing a Program that is part of the Operating System, it is said to be
       in
       (a)   Interrupt mode
       (b)   System mode
       (c)   Half mode
       (d)   Simplex mode

Ans.   (1)(d), (2)(a), (3)(b), (4)(a), (5)(d), (6)(c), (7)(d), (8)(b), (9)(b), (10)(a), (11)(a), (12)(c),
       (13)(a), (14)(b), (15)(d), (16)(c), (17)(a), (18)(a), (19)(b), (20)(a), (21)(c), (22)(d),
       (23)(d), (24)(d), (25)(d), (26)(a), (27)(a), (28)(b), (29)(a), (30)(c), (31)(b),
       (32)(b),(33)(a), (34)(b), (35)(b), (36)(c), (37)(b), (38)(a), (39)(a), (40)(b), (41)(c),
       (42)(c), (43)(b), (44)(a), (45)(b), (46)(a), (47)(d), (48)(b), (49)(a), (50)(b)

(c)   Fill in the Blanks:

1   A binary digit is called a _____.
2   A sequence of instructions for the computers is called a _____.
3   _____ is concerned with the way the hardware components operate and the way
       they are connected together.
4   _____ is concerned with the structure and behavior of the computer as seen by the
       user.
5   The manipulation of binary information is done by logic circuits called _____.
6   _____ and _____ are Universal Gates.
7   The storage elements employed in clocked sequential circuits are called _____.
8   The operations executed on data stored in registers are called _____.
9   RTL stands for _____.
10   The _____ operation sets to 1 the bits in register A where there are corresponding
       1's in register B.
11   A _____ is one that transfers 0 through the serial i/p.
12   A latch stores _____ bit of data.
13   The characteristic equation of D-Flip flop is _____.
14   Triggering of flip-flops can be classified into _____ and _____.
15   Sequential circuits can be either _____ or _____.

16   _____ is an example of sequential circuit.
17   Shift registers can be classified into _____, _____ and _____.
18   A register capable of shifting data both to the right and left is called a _____.
19   A positive edge triggered flip-flop changes state on the _____ transition of the clock pulse.
20   A _____ J-K flip flop uses both the positive and the negative edge of the clock pulse for data transfer.

Ans.   (1)(bit), (2)(program), (3)(computer organization), (4)(computer architecture), (5)(gates), (6)(NAND and NOR), (7)(flip flops), (8)(micro-operations), (9)(register transfer language), (10)(selective set), (11)(logical shift), (12)(One), (13)($Q_{n+1} = D$), (14)(Edge Triggered and level Triggered), (15)(Synchronous, Asynchronous), (16)(Flip flop/Register/Counter), (17)(SISO, SIPO, PISO, PIPO), (18)(Bidirectional Shift Register), (19)(low to high), (20)(Master slave)

II   Short Answer Type Questions:

1   What is a shift register?
2   A NOR gate is also referred to as a 'Negative AND gate'. Why?
3   Explain Register set with common ALU.
4   Define the following terms:
        (a)   Memory Transfer
        (b)   Bus Transfer
        (c)   Inter-Register Transfer
5   What are Shift Micro operations?
6   What is a Tri-State Buffer?
7   What are logic Micro operations?
8   What are flags? Where are they used?
9   What is register transfer language?
10   What is a decoder?
11   What is a multiplexer?
12   What is a demultiplexer?
13   How does a priority encoder differ from an ordinary encoder?
14   What do you understand by system bus?
15   What is a flip-flop?
16   What is a full-adder?
17   What are universal gates?
18   What is a flip flop?
19   What is the advantage of J-K flip flop over S-R flip flops?
20   What is meant by a clocked flip flop?
21   What is a half-adder? Write its truth table.
22   What is a full-adder? Write its truth table.
23   What is an encoder?
24   What is a decoder? What are its advantages?
25   What is a priority encoder?

26 Design a 4 bit incrementer circuit using full adders.
27 Define the term selective set with example.
28 It is stated that both an arithmetic shift left and logical Shift left correspond to multiplication by 2when there is no overflow and if overflow occurs then arithmetic and logical shift produce different results. State that these statements are true or false taking 5 bits 2's complement No.
29 An output program resides in memory starting from address 2300. It is executed after the computer recognizes an interrupt. What instruction must be placed at address 1?
30 List the micro-operation tha transfer bit 1-8 of register A to bit 9-16 of register B and bit 1-8 of register B to bit 9-16 of register A. Draw a block diagram of the hardware required.
31 Which register keeps track of the instruction stored in program stored in memory?

III   Long Answer Type Questions:
1 Explain the Shift Micro operations in detail.
2 Explain the logic Micro operations in detail.
3 Explain binary parallel adder/subtractor.
4 Explain all register transfer operations in detail.
5 Discuss all memory reference operations in detail.
6 Explain I/O reference instructions.
7 What is a computer register? Explain the various types of registers along with their functionality.
8 Implement 5 X 32 decoder using four 3 X 8 decoder and a 2 X 4 decoder.
9 Design a 4-bit Arithmetic circuit.
10 Draw the logic diagram of a 2-to-4 line decoder with only NOR gates. Include an enable input.
11 Design a 64:1 multiplexer using 16:1 multiplexers.
12 Design XNOR gate using minimum number of NAND gates only.
13 Design a digital circuit that performs the four logic operations of X-OR, X-NOR, NOR and NAND. Use two selection lines. Show one typical stage.
14 An 8-bit register contains the binary value 10011100. What is the register value after arithmetic shift right? Starting from the initial value, determine the register value after an arithmetic shift left and state whether there is an overflow?
15 Starting from initial value R=11011101, determine the sequence of binary values in R, after a LSL, followed by a CSR, followed by a LSR and then CSL.
16 Design a 4-bit decrementer circuit using full adders.
17 Explain the functionality of Master-slave JK flip flop in detail.
18 Explain SR and JK flip flops in detail.
19 What are shift registers? Explain the various types of shift registers.
20 Explain bidirectional shift register.
21 Karnaugh Maps are useful for finding minimal implementations of Boolean expressions with only a few variables. Using the following K-Map:
   (i)   Find the minimal sum of products expression. Show your groupings.
   (ii)   Find the minimal sum of products expression. Show your groupings.
   (iii) Are your solutions unique? If not, list and show the other minimal expression?

(vi)   Does the minimal product of sums expression equal to minimal sum of products expression?

22   Construct a 5-to-32 line decoder with four 3-to-8 decoders using enable and one 2-to4 line decoder.

23   Design a 4-bit combinational circuit shifter. What is the value of output H in 4-bit combinational circuit if input A is 1001, S=1, $I_R=1$ and $I_L=0$?

24   Design a typical stage to implement the following micro instructions
         P1:A<-A+B, P2:A<-A+1; P3 <- A+B+1   ,P4:A<-A'

25.   Design an arithmetic circuit with one selection variable S and two n-bit data inputs A and B the circuit generates the following four arithmetic operations in conjunction with the input carry Cin. Draw the logic diagram for the first two stages.

S	$C_{in}=0$	$C_{in=1}$
1	D=A-1	D=A+B'+1
0	D=A+B	D=A+1

26.   Illustrate the working of 4-bit bi-directional shift register.
27.   Suggest a solution to overcome the limitation on the speed of an adder.

UNIT - II

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   AR is not a type of CPU register.
2   AC stands for Arithmetic Count.
3   There can be three types of instructions namely memory reference, I/O reference and Register reference.
4   Auto increment and Auto decrement are types of addressing modes.
5   We make use of digital circuits in hardwired control.
6   Register address operands are looked in cahce memory .
7   The addressing mode used in an instruction of the form ADD X , Y is Direct Addressing
8.   A group of bits that tell the computer to perform a specific operation is known as instruction code.
9.   The load instruction is mostly used to designate a transfer from memory to a processor register known as instruction register.
10.   Content of the program counter is added to the address part of the instruction in order to obtain the effective address.
11.   Stack overflow causes hardware Interrupt
12.   The most common addressing techniques employed by a CPU is Indexed Addressing
13.   The program counter register counts the number of instructions executed so far.

14. Stack can be created in memory as well as register.
15. More no of addressing modes add to the flexibility of the program
16. RISC system are preferred over CISC
17. One of the operands must reside in accumulator.
18. Array locations are referenced using indexed addressing mode
19. More number of registers in the CPU slows down the program execution.
20. Data dependency enhances the pipeline speed.

Ans. (1)(F), (2)(F), (3)(T), (4)(T), (5)(T), (6)(F), (7)(T), (8)(T), (9)(T), (10)(T), (11)(F), (12)(F), (13)(F), (14)(T), (15)(T), (16)(T), (17)(T), (18)(T), (19)(F), (20)(F)

(b)   Multiple Choice Questions:

1   Stack is a _____
     (a)   LIFO
     (b)   FIFO
     (c)   LILO
     (d)   None of the above

2   RISC stands for _____.
     (a)   Reduced Information Set Computer
     (b)   Reduced Instruction Set Computer
     (c)   Reduced Instruction Set Cycle
     (d)   Reduced Information Sequence Computer

3   Indirect addressing requires _____ references to memory.
     (a)   0
     (b)   3
     (c)   2
     (d)   1

4   Which of the following is a type of addressing mode?
     (a)   Immediate
     (b)   Direct
     (c)   Relative
     (d)   All of the above

5   Data dependency is a short coming of _____
     (a)   Vector processing
     (b)   Arithmetic Pipeline
     (c)   Instruction Pipeline
     (d)   None of the above

6   When CPU is executing a Program that is part of the Operating System, it is said to be in
     (a)   Interrupt mode

(b) System mode
(c) Half mode
(d) Simplex mode

7 An n-bit microprocessor has
(a) n-bit program counter
(b) n-bit address register
(c) n-bit ALU
(d) n-bit instruction register

8 Ring Counters are
(a) Counters which indicate how long ago their associated pages have been referenced.
(b) Registers which keep track of when the program was last accessed.
(c) Counters to keep track of last accessed instruction.
(d) Registers in which last bit is fed back to first bit,.

9 The instruction 'ORG O' is
(a) Machine Instruction.
(b) Pseudo instruction.
(c) High level instruction.
(d) Memory instruction.

10 Translation from symbolic program into Binary is done in
(a) Two passes.
(b) Directly
(c) Three passes
(d) Four passes

21 A stack organized computer uses instruction of
(a) Indirect Addressing
(b) Two Addressing
(c) Zero Addressing
(d) Index Addressing

12 In a program using subroutine call instruction, it is necessary to
(a) Initialize program counter
(b) Clear the accumulator
(c) Reset the microprocessor
(d) Clear the instruction register

13 When CPU is executing a program that is a part of operating system , it is said to be in
(a) Interrupt mode
(b) System mode
(c) Half mode

(d)   Simplex mode

14   _____ register keeps track of the instructions stored in program stored in memory.
(a)   Address register (AR)
(b)   Index register (XR)
(c)   Program Counter(PC)
(d)   Accumulator (AC)

15   The addressing mode used in an instruction of the form ADD X , Y is
(a)   Absolute
(b)   Indirect
(c)   Index
(d)   None of these

16   "Aging Registers" are
(a)   Counters which indicate how long ago their associated pages have been referenced.
(b)   Register which keeps track of when the program was last accessed.
(c)   Counters to keep track of last accessed instruction.
(d)   Counters to keep track of the latest data structures referred.

17   A BSA instruction is
(a)   Branch and store instruction
(b)   Branch and save instruction
(c)   Branch and shift instruction
(d)   Branch and second instruction

18   A group of bits that tell the computer to perform a specific operation is known as
(a)   Instruction code
(b)   Micro-operation
(c)   Accumulator
(d)   register

19   The load instruction is mostly used to designate a transfer from memory to a processor register known as
(a)   Accumulator
(b)   Instruction register
(c)   Program counter
(d)   Memory address register

20   Content of the program counter is added to the address part of the instruction in order to obtain the effective address is called
(a)   Relative addressing mode
(b)   Index addressing mode
(c)   Register addressing mode

(d)   Implied addressing mode

21   Status bit is also known as
    (a)   Binary bit
    (b)   Flag bit
    (c)   Signed bit
    (d)   Unsigned bit

22   Which of the following is not a characteristics of RISC architecture
    (a)   Large instruction set
    (b)   One instruction per cycle
    (c)   Simple addressing modes
    (d)   Register to register operation

23   Stack overflow causes
    (a)   Hardware interrupt
    (b)   External interrupt
    (c)   Internal interrupt
    (d)   Software interrupt

24   Zero address instruction format is used for
    (a)   RISC architecture
    (b)   CISC architecture
    (c)   Von-Neumann architecture
    (d)   Stack organized architecture

25   After fetching the instruction from the memory, the binary code of the instruction goes to
    (a)   Instruction register
    (b)   Program counter
    (c)   Accumulator
    (d)   Instruction pointer

26   In reverse polish notation, A + B * C becomes
    (a)   AB * C +
    (b)   ABC * +
    (c)   ABC + *
    (d)   None of these

27   In _____ addressing mode, the address part of the instruction designate an address of a memory word in which the address of the operand is found.
    (a)   Indirect
    (b)   Direct
    (c)   Random
    (d)   All of the above

28   Zero address instructions are applied in a special memory organization called
      (a)   Program counter
      (b)   Instruction decoder
      (c)   Stack
      (d)   None of the above

29   While performing the operations the ALU takes data from the temporary storage area inside the CPU named
      (a)   Floppy disk
      (b)   RAM
      (c)   Registers
      (d)   CD

30   In reverse polish notation, expression A * B + C * D is written as
      (a)   AB * CD * +
      (b)   AB * C + D
      (c)   AB * CD + *
      (d)   * AB * CD +

31   Computers use addressing mode techniques for _____
      (a)   Giving programming versatility to the user by providing facilities as pointers to the memory counters for loop control.
      (b)   To reduce number of bits in the field of instructions
      (c)   Specifying rules for modifying or interpreting address field of the instruction
      (d)   All of the above

31   Processors of all computers, whether micro, mini or mainframe must have
      (a).   ALU
      (b)   Primary Storage
      (c)   . Control unit
      (d)   All of above

32   What is the control unit's function in the CPU?
      (a)   To transfer data to primary storage
      (b)   To store program instruction
      (c)   To perform logic operations
      (d)   To decode program instruction

33   What is meant by a dedicated computer?
      (a)   Which is used by one person only?
      (b)   Which is assigned to one and only one task?
      (c)   Which does one kind of software?
      (d)   Which is meant for application software only?

34   The most common addressing techniques employed by a CPU is
      (a)   Immediate
      (b)   Direct

(c)   Indirect
(d)   Register
(e.)   all of the above

35   Pipeline implement
(a)   Fetch instruction
(b)   Decode instruction
(c.)   fetch operand
(d)   Calculate operand
(e)   Execute instruction
(f.)   all of above

36   Which of the following code is used in present day computing was developed by IBM corporation?
(a)   ASCII
(b)   Hollerith Code
(c)   Baudot code
(e)   EBCDIC code

37.   When a subroutine is called, the address of the instruction following the CALL instructions stored in/on the
(a)   stack pointer
(b)   accumulator
(c)   program counter
(d)   stack

38.   A micro-program written as string of 0's and 1's is a
(a).   symbolic microinstruction
(b)   Binary microinstruction
(c)   Symbolic micro-program
(d)   Binary micro-program

39   Interrupts which are initiated by an instruction are
(a)   Internal
(b)   External
(c)   Hardware
(e)   software

40   Memory access in RISC architecture is limited to instructions
(a)   CALL and RET
(b)   PUSH and POP
(c)   STA and LDA
(d)   MOV and JMP

41.   In register addressing mode operands are looked at
(a)   In cache

[b]　　In secondary storage
(c)　　In CPU
(d)　　In primary memory

42.　What can be used to store one or more bits of data, which can accept and/or transfer information serially?
(a)　Register
(b)　Flip flop
(c)　Counter
(d)　None of these

43.　Which addressing mode execute its instructions within CPU without the necessity of reference memory for operands?
(a)　Implied Mode
(b)　Immediate Mode
(c)　Direct Mode
(d)　Register Mode

44. How is the effective address of base-register calculated?
(a)　By addition of index register contents to the partial address in instruction
(b)　By addition of implied register contents to the partial address in instruction
(c)　By addition of index register contents to the complete address in instruction
(d)　By addition of implied register contents to the complete address in instruction

45.　. Which register holds the address for a stack whose value is supposed to be directed at the topmost position?
(a)　Stack Pointer
(b)　Stack Register
(c).　Both a & b
(d).　None of the above

46　The instructions based on the stack operations are also known as 'zero address' or 'implied instructions', because _____.
(a)　address gets updated automatically in stack pointer
(b)　processor can refer a memory stack without specifying the address
(c)　both a & b
(d)　none of the above

47.　What is another name of memory stack especially given for the fundamental function performed by it?
(a)　Last-in-first-out (LIFO)
(b)　First-in-last-out (FILO)
(c)　First-in-first-out (FIFO)
(d)　Last-in-last-out (LILO)

48.   What does the last instruction of each subroutine that transfer the control to the instruction in the calling program with temporary address storage , called as?
a. jump to subroutine
b. branch to subroutine
c. return from subroutine
d. call subroutine

49.   The transfer of branch information to the microprocessor by an interrupting source through the data bus is called as _____.
(a)   Vectored Interrupt
(b)   Non-vectored Interrupt
(c)   Priority Interrupt
(d)   None of the above

50.   Which program controllable flipflop is in-built in microprocessor specifically used to set or clear the program instructions?
(a)   IEN flip-flop
(b)   IDN flipflop
(c)   SR flipflop
(d)   D flipflop

Ans.   (1)(a), (2)(b), (3)(b), (4)(d), (5)(c), (6)(b), (7)(d), (8)(d), (9)(b), (10)(a), (11)(c), (12)(d), (13)(b), (14)(c), (15)(c), (16)(a), (17)(b), (18)(a), (19)(a), (20)(a), (21)(b), (22)(a), (23)(c), (24)(c), (25)(a), (26)(b), (27)(a), (28)(c), (29)(c), (29)(a), (30)(d), (31)(d), (32)(d), (3)(b), (34)(e), (35)(f), (36)(d), (37)(d), (38)(c), (39)(b), (40)(c), (41)(c), (42)(d), (43)(d), (44)(a), (45)(a), (46)(c), (47) (a), (48)(c), (49)(a), (50)(a)

(c)   Fill in the Blanks:

1   The control variables at any given time can be represented by a string of 1's and 0's called a _____.
2   A memory that is part of control unit is called _____.
3   The next address generator is called a _____.
4   RISC stands for _____.
5   A _____ is a rule that transforms the instruction code into a control memory address.
6   Stack is a _____ (LIFO/FIFO)
7   _____ and _____ are the two stack operations.
8   The _____ is used to locate the operands needed for the operation.
9   In _____ the operands are specified implicitly in the instruction.
10   In _____, the content of an index register is added to address part of instruction to obtain effective address.
11   A _____ sub-routine is a sub-routine that calls itself.
12   Privileged instructions can be executed in _____ mode.
13   The three major types of interrupts are _____, _____ and _____.

14   _____ Architecture have a number of instructions typically form 100 to 250 instructions.
15   A _____ is a group of bits that instruct the computer to perform a specific operation.
16   The _____ is defined as the address of operand in instruction or target address.
17   The size of PC is _____ bits.
18   The _____ is the hardware implementation of a branch and save return address operation.
19   D_7 bit is 0 in _____ instructions.
20   _____ References to memory are required in direct addressing.

Ans.   (1)(control word), (2)(control memory), (3)(sequencer), (4)(Reduced Instruction Set Computer), (5)(mapping), (6)(LIFO), (7)(push and pop), (8)(mode field), (9)(implied mode), (10)(indexed addressing mode), (11)(recursive), (12)(supervisor), (13)(external, internal and software), (14)(CISC), (15)(instruction code), (16)(effective address), (17)(12 bits), (18)(interrupt cycle), (19) (Memory Reference), (20)(two).

II   Short Answer Type Questions:

1   Differentiate between
      (a)   Implied Mode and Immediate Mode
      (b)   Relative addressing and Indexed addressing mode
2   Differentiate between RISC and CISC architecture.
3   Explain the concept of Overlapped Register Windows.
4   What is Instruction Cycle?
5   What are interrupts?
6   What is a Control Word?
7   What are the characteristics of RISC Computers?
8   What are the characteristics of CISC computes?
9   What is the difference between a direct and indirect address instruction?
10   What is micro programmed control?
11   What is hardwired control?
12   Differentiate between Hardwired and micro programmed control
13   What is a stack?
14   What is control memory?
15   Define parallelism in microinstruction.
16   Explain the use of subroutine with the help of suitable example
17   Justify the statement "Stack computer consists of an operation code only with no address field".
18   Explain the different types of mapping procedures in the organization of cache memory with diagram.
19   Explain the difference between vectored and non-vectored interrupt. Explain stating examples of each.
20   Briefly discuss the steps followed in designing a CPU.
21   A processor has 16 registers, an ALU with 16 logic and arithmetic functions and a shifter with 8 operations, all connected by an internal processor. Design a micro-instruction format to specify the various micro operation for the processor.

22   The content at the top of a memory stack is 5320. The content of the stack pointer SP is 3560. A two word call subroutine instruction is located in memory at address 1121. What are the content of PC, SP and the top of the stack before the call instruction is fetched from the memory.

23   A micro-programmed CPU has 1k words in control memory. Each instruction needs 8 microinstructions. Assuming that opcode is 5 bits, propose a mapping scheme to generate a control memory address for each opcode.

24   How subroutine call is different from branching.

25   Formulate mapping procedures that provide 8 consecutive microinstructions for each routine. The opcode has six bits and the control memory has 2048 words.

III   Long Answer Type Questions:

1   What do you understand by addressing modes? Explain all of them in detail.

2   Explain the concept of delayed load using RISC pipeline.

3   Describe General Register Organization of the system.

4   What is the difference between a direct and indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register? Explain with the help of an example.

5   Explain the various instruction formats in detail.

6   Explain Instruction Cycle in detail.

7   Discuss the design of basic computer in detail.

8   Discuss stack organization and its application.

9   Explain interrupt cycle in detail.

10   Explain the general register organization of basic computer.

11   Convert the following expression in reverse polish notation showing the stack operations.
      (A * [B + C * (D + E)]) / [F (G + H)]

12   Convert the following into Post Fix
      (a)   A * B + C * D + E * F
      (b)   {A * (B + C) * (D + E)} / F * (G + H)

13   Let X= (A + B) * (C + D)
      Solve the above using three address and zero address instructions.

14   Let X = A * B + C * D
      Calculate the above function using
      (i)   three-address instruction
      (ii)   two-address instruction
      (iii)   zero-address instruction

15   Draw the flowchart for computer operation.

16   Design a circuit showing one stage of adder and logic circuit.

17   Draw a timing diagram assuming that SC is cleared at time T_3 if control signal C_7 is active.
            C_7T_3: SC$\leftarrow$0
      C_7 is activated with the positive clock transition associated with T_1.

18   The content of AC in the basic computer is hexadecimal A937 and the initial value of E is 1. Determine the contents of AC, E, PC, AR, and IR in hexadecimal after the

execution of the CLA instruction. Repeat 11 more times starting from each one of the register reference instruction. The initial value of PC is hexadecimal 021.

19 An instruction is stored at location 300 with its address field at location 301. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is
(i) Direct   (ii) Immediate   (iii) Relative   (iv) Register indirect
(v) Index with R1 as the index register

20 Evaluate the given expression: `9 7 + 5 3 - /`

21 Convert the following numerical arithmetic expression in reverse polish notation and show the stack operations for evaluating the numerical result (3+4) [10 (2+6) + 8].

22 Give the organization of typical hardwired control unit and explain the functions performed by the various blocks.

23 The content of PC in basic computer is 3AF (all numbers are in hexadecimal). The content of AC is 7EC3. The content of memory at address 3AF is 932E. the content of memory address 32E is 09AC. The content of memory at address 9AC is 8B9F.
(a)   What is the instruction that will be fetched and executed next?
(b)   Show the binary operation that will be performed in the AC when the instruction is executed?
(c)   Give the contents of registers PC, AR, DR, AC, and IR in hexadecimal and the values of E, I, and the sequence counter SC in binary at the end of instruction cycle.

24 With a neat block diagram, explain in detail about micro programmed control unit and explain its operations.

25 An instruction at address 021 in the basic computer has I=0, and operation code of AND instruction and an address part equal to 083(all numbers are in hexadecimal). The memory word at address 083 contains the operand B8F2 and the content of AC is A937. Go over the instruction cycle and determine the contents of the following registers at the end of the execute phase: PC, AR, DR, AC, and IR. Repeat the problem six more times starting with an operation code of another memory reference instruction.

26 A digital computer has a memory unit with 24 bits per word. The instruction set consists of 190 different operations. Each instruction is stored in one word of memory and consists of an op-code part and address part.
(i)   How many bits are needed for operation code?
(ii)   How many bits are left for the address part of an instruction?
(iii)   How many words can be accommodated in the memory unit?

27 Write a program to evaluate the arithmetic X= (A-B+C*(D*E-F))/(G+H*K) using general purpose register with two address and one address instruction.

28 Design a common bus system for basic computer with 8 registers PC, AR, IR, TR, DR, AC, OUTR, INPR and memory capacity of 4096 words and each word contain 16 bits ,input and output operations are performed using 8 bits.

29   Design micro program sequencer for a control memory.

30 Describe Timing and Control Unit.

UNIT - III

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   The interface registers communicate with the CPU through unidirectional data bus.
2   The two register selected inputs RSI and RSO are connected to two most significant lines of address bus.
3   The strobe control method of asynchronous data transfer employs a single control line to time each transfer.
4   The transfer of data between two units may be done in parallel or serial.
5   Serial transmission is always synchronous.
6   The operation of asynchronous communication interface is initialized by the CPU by sending a byte to the control register.
7   A first in first out (FIFO) buffer is memory unit that stores information in such a manner the item last in is the item first out.
8   Programmed I/O operations are the results of I/O instructions written in the computer program.
9   A polling procedure is used to identify the highest priority source by software means.
10   The transfer of data between a fast storage device and memory is enhanced by the speed of CPU.
11   Parallel processing is established by distributing data among multiple functional units.
12   The sequence of instruction read from memory constitutes an instruction stream.
13   MIMD represents an organization that includes many processing units under the supervision of common control unit.
14   Flynn's classification depends on distinction between the performance of control unit and data processing unit.
15   Pipelining is a process of decomposing process into sub-operations with each sub-process being executed in a special dedicated segment.
16   Long range weather forecasting makes use of vector processing.
17   A commercial computer with vector instructions and pipelined floating point arithmetic operations is referred to as a PDA.
18   SIMD array processor is a computer with single processing unit operating in parallel.
19   NAND operation is used to selectively complement bits of an operand.
20   Arithmetic shifts conform to the rules of signed 2's complement numbers.

Ans.   (1)(F), (2)(F), (3)(T), (4)(T), (5)(F), (6)(T), (7)(F), (8)(T), (9)(T), (10)(F), (11)(T), (12)(T), (13)(F), (14)(T), (15)(T), (16)(T), (17)(F), (18)(F), (19)(F), (20)(T)

(b)   Multiple Choice Questions:

1   Booth's algorithm is used for _____ of two numbers.
    (a)   Multiplication
    (b)   Division
    (c)   Subtraction

(d)   Addition

2   Hard disk is a:
(a)   Magnetic Device
(b)   Mechanical Device
(c)   Optical Device
(d)   Magneto-Optical Device

3   Which of the following are character printers?
(a)   Dot Matrix
(b)   Laser
(c)   Daisy Wheel
(d)   All of the above

4   ASCII stands for _____.
(a)   American Standard Code for Information Interaction
(b)   American Standard Code for Introduction Interchange
(c)   American Standard Code for Information Interchange
(d)   None of the above

5   Which of the following is a method for data transfer?
(a)   Handshaking
(b)   Strobe Control
(c)   Both (a) and (b)
(d)   None of the above

6   In a vectored interrupt
(a)   The branch address is assigned to a fixed location in memory.
(b)   The interrupting source supplies the branch information to the processor through an interrupt vector.
(c)   The branch address is obtained from a register in the processor
(d)   None of the above

7   The communication between the components in a microcomputer takes place via the address and
(a)   I/O bus
(b)   Data bus
(c)   Interface
(d)   Control lines

8   An interface that provides I/O transfer of data directly to and from the memory peripheral is termed as
(a)   Transfer interface
(b)   Serial interface
(c)   Bus request interface
(d)   Direct memory access(DMA)

9   An interface that provides a method for transferring binary information between
        internal storage and external devices is called
        (a)   I/O interface
        (b)   I/O bus
        (c)   Input interface
        (d)   Output interface

10   An interrupt for which hardware automatically transfers the program to a specific
        memory location is known as
        (a)   Software interrupt
        (b)   Hardware interrupt
        (c)   Maskable interrupt
        (d)   Vector interrupt

11   Cycle stealing technique is used in
        (a)   Interrupt based data transfer
        (b)   Polled based data transfer
        (c)   DMA based data transfer
        (d)   None of these

12   DMA interface unit eliminates the need to use CPU registers to transfer data from
        (a)   MAR to MBR
        (b)   MBR to MAR
        (c)   I/O units to memory
        (d)   Memory to I/O units

13   In a non vectored interrupt, the address of the interrupt service routine is
        (a)   Obtained from interrupt address table
        (b)   Supplied by the interrupting I/O device
        (c)   Obtained through vector address generator device
        (d)   Assigned to a fixed memory location

14   A control character is sent at the beginning as well as at the end of each block in the
        synchronous transmission, in order to
        (a)   Synchronize the clock of transmitter and receiver
        (b)   Supply information needed to separate the incoming bits into individual
                 character
        (c)   Detect the error in transmission and received sysytem
        (d)   None of the above

15   The cycle stealing technique, allows the DMA controller to transfer
        (a)   Half of a data word at a time
        (b)   One block of data at a time
        (c)   One data byte at a time
        (d)   One data word at a time

16   During DMA acknowledgement cycle, CPU relinquishes
        (a)   Address bus only
        (b)   Address bus and control bus
        (c)   Control bus and data bus
        (d)   Data bus and address bus

17   _____ have been developed specifically for pipelined systems.
        (a)   Utility softwares
        (b)   Speed up utilities
        (c)   Optimizing compilers
        (d)   None of the mentioned

18   The pipelining process is also called as _____.
        (a)   Superscalar operation
        (b)   Assembly line operation
        (c)   Von neumann cycle
        (d)   None of the mentioned

19   The fetch and execution cycles are interleaved with the help of _____.
        (a)   Modification in processor architecture
        (b)   Clock
        (c)   Special unit
        (d)   Control unit

20   Each stage in pipelining should be completed within ____ cycle.
        (a)   1
        (b)   2
        (c)   3
        (d)   4

21   In pipelining the task which requires the least time is performed
        (a)   First
        (b)   Last
        (c)   Given highest priority
        (d)   None of the above

22   If a unit completes its task before the allotted time period, then
        (a)   It'll perform some other task in the remaining time
        (b)   Its time gets reallocated to different task
        (c)   It'll remain idle for the remaining time
        (d)   None of the mentioned

23   To increase the speed of memory access in pipelining, we make use of _____.
        (a)   Special memory locations
        (b)   Special purpose registers
        (c)   Cache

(d)   Buffers

24   The periods of time when the unit is idle is called as _____.
(a)   Stalls
(b)   Bubbles
(c)   Hazards
(d)   Both a and b

25   The contention for the usage of a hardware device is called as _____.
(a)   Structural hazard
(b)   Stalk
(c)   Deadlock
(d)   none of the mentioned

26   The situation where in the data of operands are not available is called _____.
(a)   Data hazard
(b)   Stock
(c)   Deadlock
(d)   Structural hazard

27   In case of only one memory operand, when a second operand is needed, as in the case
of an Add instruction, we use processor register called.........
(a)   accumulator
(b)   register
(c)   operand
(d)   source

28   Data transfer between the main memory and the CPU register takes place through two
registers namely.......
(a)   General purpose register and MDR
(b)   Accumulator and program counter
(c)   MAR and MDR
(d)   MAR and Accumulator

29   The pipeline operates on a stream of instruction by overlapping the phases
of instruction cycle is........
(a)   Arithmetic pipeline
(b)   Instruction pipeline
(c)   Parallel pipeline
(d)   Multiple pipeline

30   The instruction that cause transfer of data from one location to another without
changing the binary information content are ...
(a)   Data transfer instruction
(b)   Data manipulation instruction
(c)   Register transfer instruction

(d)   Program control instruction

.31.   _____ have been developed specifically for pipelined systems.
(a)   Utility soft wares
(b)   Speed up utilities
(c)   Optimizing compilers
(d)   None of the mentioned

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(b)   Clock
(c)   Special unit
(d)   Control unit

34.   Each stage in pipelining should be completed within ____ cycle.
(a)   1
(b)   2
(c)   3
(d)   4

35.   In pipelining the task which requires the least time is performed first.
(a)   True
(b)   False

36.   If a unit completes its task before the allotted time period, then
(a)   It'll perform some other task in the remaining time
(b)   Its time gets reallocated to different task
(c)   It'll remain idle for the remaining time
(d)   None of the mentioned

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(d)   Buffers

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(c)   Hazards

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(b)   Stalk
(c)   Deadlock
(d)   none of the mentioned

40.   The situation where in the data of operands are not available is called _____.
(a)   Data hazard
(b)   Stock
(c)   Deadlock
(d)   Structural hazard

41.   Which interface allows the cardinal provision of communicating with one particular input-output device in addition to the programming capability for operating with specific device?
(a)   Parallel Peripheral Interface
(b)   Serial Communication Interface
(c)   Special Dedicated Interface
(d)   Direct Memory Access Interface

42.   Which lines are supposed to control or handle the transfer operation between two devices in asynchronous mode by apprising the status of transfer using common bus ?
(a)   Control Lines
(b)   Data Lines
(c)   Transfer Lines
(d)   Handshake Lines

43   What registers are significantly incremented and decremented respectively for the transmission of each byte by Direct Memory Access (DMA) ?
(a)   Address Register & Byte Count Register
(b)   Control Register & Byte Count Register
(c)   Transmitter Register & Byte Count Register
(d)   Status- Register & Byte Count Register

44.   Which instruction indicates the transfer of program sequence to the address specified by 16 bit value if Z flag =0 ?
(a)   CZ Address
(b)   CNZ Address
(c)   CPE Address
(d)   CPO Address

45   Which instruction is used to set the interrupt by maintaining the serial output bit in set mode of operation?
(a)   SIM

(b)   STC

(c)   SBI Data

(d)   SUI Data

46.   Which instruction set performs the dual operation of reading the status of interrupts as well as serial input data bit ?

(a)   RNZ

(b)   RZ

(c)   RPO

(d)   RIM

47.   Which type of branch instructions jump to a novel location from the continuation of previous program upon its execution?

(a)   Data Transfer Instructions

(b)   Logic Instructions

(c)   Bit-oriented Instructions

(d)   Un - conditional Instructions

48.   Which bit of micro-controller handles or controls the relationship between clock and data in serial mode of operation in coordination with CPOL ?

(a)   CPHA

(b)   DORD

(c)   MSTR

(d)   SPE

49 .   Which phenomenon occurs when WCOL bit operates in normal mode if the SPDR register writes in premature form without affecting the operation during data transfer?

(a)   Read Collision

(b)   Bit Collision

(c)   Write Collision

(d)   Data Collision

50.   Which can be treated as a major shortcoming/s of the microprocessor ?

(a)   Large Board size than micro-controller

(b)   Utility of different peripherals for several project assortments

(c)   Notification remembrance of quirks for each component

(d)   All of the above

Ans.   (1)(a), (2)(a), (3)(d), (4)(c), (5)(c), (6)(b), (7)(b), (8)(d), (9)(a), (10)(b), (11)(c), (12)(d), (13)(d), (14)(b), (15)(c), (16)(d), 17)(b), (18)(a), (19)(a), (20)(a), (21)(d), (22)(a), (23)(c), (24)(c), (25)(a), (26)(b), (27)(d), (28)(c), (29)(c), (29)(b), (30)(a), (31)(c), (32)(b), (33)(b), (34)(d), (35)(b), (36)(c), (37)(c), (38)(d), (39)(a), (40)(a), (41)(c), (42)(d), (43)(a), (44)(b), (45)(a), (46)(d), (47)(d), (48)(a), (49)(c), (50)(d)

(c)   Fill in the Blanks:

1   Input or output devices attached to the computer are called _____.

2   Three basic types of character printers are _____, _____ and _____.
3   ASCII stands for _____.
4   A _____ is issued to activate the peripheral and to inform it what to do.
5   A _____ is used to test various status conditions in the interface and the peripheral.
6   A _____ causes the interface to respond by transferring data from the bus into one of its registers.
7   The _____ causes the interface to receive an item of data from peripheral and places it in its buffer register.
8   There are _____ ways that computer buses can be used to communicate with memory and I/O.
9   The isolated I/O method isolates _____ and _____.
10   In _____, the CPU has distinct i/p and o/p instruction and each of these instructions is associated with address of an interface register.

Ans.   (1)(peripherals), (2)(daisy wheel, dot matrix and laser), (3)(American Standard Code for Information Interchange), (4)(control command), (5)(status command), (6)(data output command), (7)(data input command), (8)(three), (9)(memory and I/O addresses), (10)(Isolated I/O).

II   Short Answer Type Questions:

1   What do you understand by Hand Shaking?
2   What are different modes of Transfer?
3   Describe Daisy-chain priority Interrupt.
4   Describe Priority-Interrupt.
5   How floating-point arithmetic different from binary arithmetic?
6   What do you mean by 'bias'?
7   Differentiate between memory mapped I/O and Isolated I/O.
8   What do you understand by asynchronous Data Transfer?
9   Differentiate between strobe control and hand shaking method of Data Transfer.
10   Describe programmed (I/O).
11   Give the hardware organization for Booth's algorithm.
12   Give the hardware organization for division algorithm.
13   How does CPU initialize the DMA transfer?
14   What is the objective of cycle stealing in DMA?
15   What is a strobe?
16   What are the functions of I/O interface?
17   How does the processor handle an interrupt request?
18   What are the necessary operations needed to start an I/O operation using DMA?
19   What are the three types of channel usually found in large computers?
20   Why does a DMA have priority over the CPU when both request a memory transfer?
21   What is the advantage of using interrupt initiated data transfer?
22   Why do you need DMA?
23   What is the difference between subroutine and interrupt service routine?
24   What is the need for interrupt masks?
25   How does bus arbitration typically works?

26   How does a processor handle an interrupt?
27   Distinguish synchronous bus and asynchronous bus.
28   Why I/O devices cannot be directly be connected to the system bus?
29   What is bus arbitration?
30   What is port? What are the types of port available?
31   What is a parallel port?
32   What is a serial port?
33   What is PCI bus?
34   What do you understand by parallel processing?
35   What is Flynn's classification of parallel processing?
36   What do you understand by vector processing?
37   What is pipelining?
38   What is the difference between serial and parallel processing?
39   What is the role of cache memory in pipeline?
40   What is a pipeline hazard?
41   What is data hazard?
42   What is instruction or control hazard?
43   What do you mean by delayed branching?
44   What is branch folding?
45   What do you mean by branch penalty?

III   Long Answer Type Questions:

1   Describe DMA in detail.
2   What are the methods of asynchronous data transfer? Explain each one of them in detail.
3   Discuss the modes of data transfer to and from peripheral devices.
4   Explain the working of I/O processor in detail.
5   What are peripheral devices? Explain.
6   What is an I/O Interface? What is its need? Explain its functionality in detail.
7   Explain Programmed I/O with the help of an example.
8   Explain Array processor in detail.
9   Explain instructions pipelining and concept of resource conflicts, data dependency
10   Discuss the concept of arithmetic pipelining.
11   Explain the concept of vector processing.
12   A non-pipeline system takes 50 ns to process a task. The same task can be processed in six- segment pipeline with a clock cycle of 10ns. Determine the speed up ratio of the pipeline for 100 tasks. What is the maximum speed up that can be achieved?
13   For an instruction cycle, give a 6 segment pipeline and its timing diagram. Assume that the 4th instruction is a branch instruction.
14   Draw the space-time diagram for the given instruction:
       $Ai + Bi * Ci$ where $0 < i < 8$
15   Discuss the various hazards that might arise in a pipeline. What are the remedies commonly adopted to overcome/minimize these hazards?
16   Explain the function of a six segment pipeline showing the time it takes to process eight tasks.

17   Explain the instruction cycle highlighting the sub-cycles and sequence of steps to be followed. Also Illustrate memory read and writes operation.

18   What is the importance of I/O interface? Compare the features of SCSI and PCI Interfaces.

19   Explain the use of vectored interrupts in processes. Why is priority handling desired in interrupt controllers? How does the different priority scheme work?

20   Explain the following:
      (a)   Bus arbitration
      (b)   Printer process communication
      (c)   USB
      (d)   DMA

21   Why is read and write control lines in a DMA controller bidirectional? Under what condition and for what purpose are they used as inputs?

22   Write short notes on any two.
      (i) Instruction pipeline.
      ii) DMA based data transfer.

21   Shift operation of data in a register.

22   Explain various possible hardware schemes that can be used in an instruction pipeline in order to minimize the performance degradation caused by instruction branching.

23   Discuss DMA transfer in a computer system using block diagram in detail.

24   Design parallel priority Interrupt with 8 devices.

25   A commercial interface unit uses different manes for handshake lines associated with the transfer of data from I/O devices into interface output handshake line is labeled IBF (input buffer full). A low-level signal on STB loads data from the I/O bus into the interface data register. A high level signal on IBF indicates that the data item has been accepted by the interface. IBF goes low after an I/O read signal from the CPU when it reads the content of the data register.

UNIT - IV

I   Test Your Skills:

(a)   State Whether the Following Statements are true or false:

1   The fastest and most flexible cache organization uses an associative memory.

2   Associative memories are cheaper as compared to random-access-memories.

3   In direct mapping organization, each word of cache can store two or more words of memory under some index address.

4   When a CPU finds a word in cache during a read operation, the main memory is not involved in transfer.

5   In write back method, only the cache location is updated during a write operation.

6   An address space issued by a programmer is called physical address space.

7   When a page fault occurs in a virtual memory system, it signifies that the page referenced by the CPU is not in main memory.

8   A multi processor system with common shared memory is called loosely couple system.
9   The time slice algorithm allocates a fixed length time slice of bus time that is offered sequentially to each processor in round robin fashion.
10   The LRU algorithm gives the least priority to the requesting device that has not used the bus for the longest interval.
11.   Associative and content addressable memory are same.
12.   L1,L2 are cache memory
13.   Cache Memory are based on the concept of locality of reference.
14.   ROM is also RAM.
15   TRAP is software Interrupt
16.   Daisy chaining has advantage of parallel priority interrupt
17.   Using DMA CPU can be freed for other task while I/O is transferring data to memory
18.   Registers are faster than Cache
19.   Cache coherence is a major issue in cache memory
20.   CAM is used for searching

Ans.   (1)(T), (2)(F), (3)(T), (4)(T), (5)(T), (6)(F), (7)(T), (8)(F), (9)(T), (10)(F), (11)(t), (12)(T), (13)(T), (14)(T), (15)(T), (16)(F), (17)(T), (18)(T), (19)(T), (20)(T)

(b)   Multiple Choice Questions:

1   CAM Stands for_____.
        (a)   Content Area Message
        (b)   Content Addressable Memory
        (c)   Common Area Memory
        (d)   None of the above

2   ROM is:
        (a)   Non-Volatile
        (b)   Random Access Device
        (c)   Programmable
        (d)   All of the above

3   _____ is the fastest memory.
        (a)   RAM
        (b)   ROM
        (c)   Secondary
        (d)   Cache

4   The initial program to start the computer is known as_____
        (a)   Bootstrap Loader
        (b)   Loader
        (c)   Bootstrap Linker
        (d)   None of the above

5   Page fault occur when:
     (a)   Page is corrupted by application software
     (b)   Page is in memory
     (c)   Page is not in memory
     (d)   Divide by 0

6   Which interrupt has the highest priority?
     (a)   INTR
     (b)   TRAP
     (c)   RST6.5

7   In 8085 name the 16 bit registers?
     (a)   Stack pointer
     (b)   Program counter
     (c)   Both (a) and (b)

8   Which of the following is hardware interrupts?
     (a)   RST5.5, RST6.5, RST7.5
     (b)   INTR, TRAP
     (c)   a & b

9   What is the RST for the TRAP?
     (a)   RST5.5
     (b)   RST4.5
     (c)   RST4

10   What are level Triggering interrupts?
     (a)   INTR&TRAP
     (b)   RST6.5&RST5.5
     (c)   RST7.5&RST6.5

11   Which interrupt is not level sensitive in 8085?
     (a)   RST6.5 is a raising edge-trigging interrupt.
     (b)   RST7.5 is a raising edge-trigging interrupt.
     (c)   Both (a) and (b).

12   What are software interrupts?
     (a)   RST 0 - 7
     (b)   RST 5.5 - 7.5
     (c)   INTR, TRAP

13   Which stack is used in 8085?
     (a)   FIFO
     (b)   LIFO
     (c)   FILO

14   Why 8085 processor is called an 8 bit processor?

(a)   Because 8085 processor has 8 bit ALU.
(b)   Because 8085 processor has 8 bit data bus.
(c)   Both (a) and (b).

15   What is SIM?
(a)   Select Interrupt Mask
(b)   Sorting Interrupt Mask
(c)   Set Interrupt Mask.

16   RIM is used to check whether, _____
(a)   The write operation is done or not
(b)   The interrupt is Masked or not
(c)   Both (a) and (b).

17   What is meant by Maskable interrupts?
(a)   An interrupt which can never be turned off.
(b)   An interrupt that can be turned off by the programmer.
(c)   None of the above.

18   In 8086, Example for Non-maskable interrupts is
(a)   Trap
(b)   RST6.5
(c)   INTR

19   What does microprocessor speed depends on?
(a)   Clock
(b)   Data bus width
(c)   Address bus width

20   Can ROM be used as stack?
(a)   Yes
(b)   No
(c)   Sometimes yes, sometimes no

21   Which processor structure is pipelined?
(a)   All x80 processors
(b)   All x85 processors
(c)   All x86 processors

22   Address line for RST3 is?
(a)   0020H
(b)   0028H
(c)   0018H

23   In 8086 the overflow flag is set when
(a)   The sum is more than 16 bits

(b)   Signed numbers go out of their range after an arithmetic operation
(c)   Carry and sign flags are set
(d)   During subtraction

24   The advantage of memory mapped I/O over I/O mapped I/O is,
(a)   Faster
(b)   Many instructions supporting memory mapped I/O
(c)   Require a bigger address decoder
(d)   All the above

25   BHE of 8086 microprocessor signal is used to interface the
(a)   Even bank memory
(b)   Odd bank memory
(c)   I/O
(d)   DMA

26   In 8086 microprocessor the following has the highest priority among all type interrupts.
(a)   NMI
(b)   DIV 0
(c)   TYPE 255
(d)   OVER FLOW

27   In 8086 microprocessor one of the following statements is not true.
(a)   Coprocessor is interfaced in MAX mode
(b)   Coprocessor is interfaced in MIN mode
(c)   I/O can be interfaced in MAX / MIN mode
(d)   Supports pipelining

28   8088 microprocessor differs with 8086 microprocessor in
(a)   Data width on the output
(b)   Address capability
(c)   Support of coprocessor
(d)   Support of MAX / MIN mode

29   Address line for TRAP is?
(a)   0023H
(b)   0024H
(c)   0033H

30   The set of control lines for both input and output in a microprocessor   are known as:-
(a)   Address Bus
(b)   Data Bus
(c)   Control Bus
(d)   Switches

31. The smallest entity of memory is called as _____ .
    (a) Cell
    (b)   Block
    (c) Instance
    (d) Unit

32. The collection of the above mentioned entities where data is stored is called as _____ .
    (a) Block
    (b)   Set
    (c) Word
    (d) Byte

33. An 24 bit address generates an address space of _____ locations .
    (a) 1024
    (b)   4096
    (c) 2 ^ 48
    (d) 16,777,216

34. If a system is 64 bit machine , then the length of each word will be ____ .
    (a) 4 bytes
    (b) 8 bytes
    (c) 16 bytes
    (d) 12 bytes

35. The type of memory assignment used in Intel processors is _____ .
    (a) Little Endian
    (b) Big Endian
    (c) Medium Endian
    (d) None of the above

36. When using the Big Endian assignment to store a number, the sign bit of the number is stored in _____.
    (a) The higher order byte of the word
    (b)   The lower order byte of the word
    (c) Can't say
    (d) None of the above

37. To get the physical address from the logical address generated by CPU we use ____.
    (a) MAR
    (b) MMU
    (c) Overlays
    (d) TLB

38. _____ method is used to map logical addresses of variable length onto physical memory.
    (a) Paging

(b) Overlays
(c) Segmentation
(d) Paging with segmentation

39. During transfer of data between the processor and memory we use _____ .
 (a) Cache
 (b) TLB
 (c) Buffers
 (d) Registers

40. Physical memory is divided into sets of finite size called as _____ .
 (a) Frames
 (b) Pages
 (c) Blocks
 (d) Vectors

41. Which parameter/s is/ are of relevant importance regarding the time interval of memory cycle specified by the microprocessor?
 (a) internal clock frequency and access time
 (b) external clock frequency and access time
 (c) internal as well as external clock frequencies
 (d) only access time

42. Which form of special control unit enables the memory to adjust or set its own timing of memory cycle in the microprocessors?
 (a) set
 (b) reset
 (c) ready
 (d) enable

43. Which among the below stated operating condition implies that the contents of register C get deliver to a memory byte at the definite address specified by AR ?
 (a) $M[AR] \rightarrow C$
 (b) $M[AR] \leftarrow C$
 (c) $AR \rightarrow M[C]$
 (d) $AR \leftarrow M[C]$

44. Which add instruction/s occupy the three memory bytes in accordance to the various length format acquired at the stage of microprocessor sequencing?
 (a) Add B to A
 (b) Add immediate operand to A
 (c) Add operand specified by an address to A
 (d) All of the above

45. Which data-bus has a proficiency of reducing the number of accesses to memory in response to the speed related shortcomings displayed by 8-bit microprocessor?
 (a) 8 - bit data bus

(b)   16 - bit data bus
(c)   24 - bit data bus
(d)   32 - bit data bus

46.   How many memory cycles should the microprocessor undergo for an execution of instructions, especially the instruction include the address of the operand?
(a)   2 memory cycles
(b)   4 memory cycles
(c)   8 memory cycles
(d)   any number depending upon the number of operands in the instruction

47.   Which category of microprocessor instructions detect the status conditions in registers and accordingly exhibit the variations in program sequence on the basis of detected results?
(a)   Transfer Instructions
(b)   Operation Instructions
(c)   Control Instructions
(d)   All of the above

48.   The push and pop instructions belonging to the category of transfer instructions of microprocessor perform data transformation between _____.
(a)   two registers
(b)   processor register and memory stack
(c)   processor register and interface register
(d)   interface register and memory word

49.   Which control instruction is followed by an un-conditional branch instructions so as to branch to a single location from the double ones with respect to specified status-bit condition?
(a)   jump instruction
(b)   branch instruction
(c)   skip instruction
(d)   return- from-subroutine instructions

50   The transfer of branch information to the microprocessor by an interrupting source through the data bus is called as _____.
(a)   Vectored Interrupt
(b)   Non-vectored Interrupt
(c)   Priority Interrupt
(d)   None of the above

Ans.   (1)(b), (2)(d), (3)(d), (4)(a), (5)(c), (6)(c), (7)(c), (8)(c), (9)(b), (10)(b), (11)(b), (12)(a), (13)(b), (14)(a), (15)(c), (16)(b), (17)(b), (18)(a), (19)(c), (20)(b), (21)(c), (22)(c), (23)(b), (24)(d), (25)(b), (26)(a), (27)(b), (28)(a), (29)(b), (30)(d) (31)(a), (32)(c), (33)(b), (34)(e), (35)(f), (36)(d), (37)(d), (38)(c), (39)(d), (40)(a)(41)(a)(42)c)(43)(b), (44)(c), (45)(b), (46)(b), (47)(c), (48)b), (49)(c), (50)(a)

(c)   Fill in the Blanks:

1   The memory unit that communicates directly with the CPU is called _____.
2   Devices that provide backup storage are called _____.
3   A special very high speed memory used to increase the speed of processing is called _____.
4   Block size in auxiliary memory ranges from _____ words.
5   Cache block size ranges from _____ words.
6   The existence of two or more programs in different parts of memory at the same time is _____.
7   RAM chips are available in two operating modes _____ and _____.
8   ROM stands for _____.
9   The initial program to start the computer is stored in _____.
10   The most common auxiliary memory devices used in computer systems are _____ and _____.
11   A memory unit accessed by content is called _____.
12   In associative memory, the _____ register provides a mask for choosing a particular field in argument word.
13   References to memory at any given interval of time tend to be confined within few localized areas in memory. This concept is known as _____.
14   The performance of cache memory is frequently measured in terms of quantity called _____.
15   Three types of mapping with reference to the cache organization are _____, _____ and _____.

Ans.   (1)(main memory), (2)(auxiliary memory), (3)(cache memory), (4)(256 to 2048), (5)(1 to 16), (6)(multiprogramming), (7)(static and dynamic), (8)(Read Only Memory), (9)(bootstrap loader), (10)(magnetic disks and tapes), (11)(content addressable memory), (12)(key), (13)(locality of reference), (14)(hit ratio), (15) (associative, direct and set associative)

II   Short Answer Type Questions:

1   Why is the Cache memory used between central processing unit and main memory?
2   What is CAM?
3   What is meant by cache coherence?
4   Write short notes on:
     (a)   Cache memory
     (b)   Virtual memory
5   What do you understand by RAM?
6   What is ROM?
7   What is a bootstrap loader?
8   Differentiate between static RAM and dynamic RAM.
9   What are Magnetic disks?
10   What are Magnetic tapes?

11   What is Auxiliary Memory?
12   What is locality of reference?
13   What is hit ratio?
14   How does cache is initialized?
15   Differentiate between address space and memory space.
16   Define Memory Access time for a computer system with two levels of caches.
17   Define memory cycle time.
18   What are the enhancements used in the memory management?
19   What is RAID?
20   Define data stripping?
21   How the data is organized in the disk?
22   Define latency time.
23   What is the significance of TLB?
24   What is Memory management hardware?
25   Differentiate between ROM, PROM and EPROM.
26.   Explain the different types of mapping procedures in the organization of cache memory with diagram.
27   Explain the difference between vectored and non-vectored interrupt. Explain stating examples of each.
28   Differentiate between virtual and cache memory.
29   Discuss the different ways in which ROM can be programmed.
30   What is the significance of initializing cache? How is it done?
31   Differentiate between the terms external, internal and software interrupts.
32   A two-way set associative cache memory uses blocks of 4 words. The cache can accommodate a total of 2048 words from main memory. The main memory size is 128k
32.   what are the sizes of :-
        (i) TAG   (ii) Index   (iii) Data   (iv) Cache memory   ?

III   Long Answer Type Questions:

1   Explain the concept of virtual memory.
2   Describe various interconnection structures.
3   Describe various mapping methods for cache memory in detail.
4   Develop match logic for associative memory.
5   What is cache memory? Discuss direct mapping method.
6   Explain multi-port memory.
7   What do you understand by Memory Hierarchy? Explain.
8   Explain the concept of Memory Address Map with the help of an example.
9   What are the main differences between Primary and Secondary Memory? Explain each one of them in detail.
10   Explain the concept of Interprocessor Communication and Synchronization.
11   A digital computer has a memory unit of 64K X 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words.
        (a)   How many bits are there in the tag, index, block, and word fields of the address format?

(b)   How many bits are there in each word of cache and how are they divided in functions?

(c)   How many blocks can the cache accommodate?

12   A computer uses RAM chips of 1024 X 1 capacity.

(a)   How many chips are needed, and how should their address lines be connected to provide a memory capacity of 1024 bytes?

(b)   How many chips are needed to provide a memory capacity of 16K bytes?

13   A two-way set associative cache memory uses blocks of four words. The cache can accommodate a total of 2048 words from main memory. The main memory size is 128K X 32.

(a)   Formulate all pertinent information required to construct the cache memory.

(b)   What is the size of the cache memory?

14   What is the transfer rate of an eight-track magnetic tape whose speed is 120 inches per second and whose density is 1600 bits per inch?

15   Discuss the various mapping techniques used in cache memories.

16   A computer system has a main memory consisting of 16 M words. It also has a 32Kword cache organized in the block-set-associative manner, with 4 blocks per set and 128 words per block.

(a)   Calculate the number of bits in each of the TAG, SET and WORD fields of the main memory address format

(b)   How will the main memory address look like for a fully associative mapped cache?

17   Give the structure of semiconductor RAM memories. Explain the read and write operations in detail

18   Explain the organization of magnetic disks in detail.

19   Write a short note on PCI.

20   A digital computer has a memory unit of 64K*16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words. How many bits are there in the tag, index, block and word fields of the address format? How many blocks can the caches accommodate?

21   A virtual memory system has an address space of 8K words, a memory space of 4K words, and page and block sizes of 1K words. The following page reference changes occur during a given interval.

4 2 0 1 2 6 1 4 0 1 0 2 3 5 7

(a)   Determine the pages that are resident in main memory after each page reference change if the replacement algorithm used is (i) FIFO (ii) LRU

(b)   Also find the number of page faults in each case.

22   Explain Omega network in detail.

23   Discuss in detail the problem of cache coherence. Explain the remedial measures of it.

24   What do you understand by physical and logical address space? Explain the concept of virtual memory mapping.
25   What are multiprocessors? What are its characteristics? Explain MIMD systems.
26   Discuss different interconnection structure of microprocessor
27   What do you mean by Cache memory? Explain in detail mapping procedures used while considering organization of Cache memory.
28   Consider the 20 bit logical address. The 4-bit segment number can specify one of 16 possible segments. The 8-bit word field implies a page size of 256 words and the 8 bit word field implies a page size of 256 words.

QUESTION BANK

PRINCIPLES AND PRACTICES OF MANAGEMENT

MCA 109

QUESTION BANK
PRINCIPLES AND PRACTICES OF MANAGEMENT - MCA 109
MCA I

UNIT - I

I **Test Your Skills:**

(a) **State Whether the Following Statements are True or False:**

1   All organizations do not need management.
2   Process of management is common to every organization.
3   Administration is a higher level function than management.
4   Management is a science, art and profession at the same time.
5   Technical skills are most difficult managerial skill to acquire.
6   Scientific management focuses on worker and machine relationships.
7   Unity of command means accountability of a subordinate only to one superior.
8   No approach to management is best in all situations.
9   Holistic approach in management is based on the concept of unity between the divine, individual self and the universe.
10   Professional management signifies separation of ownership and management.
11   Necessary rigidity is required in the control design.
12   Drucker emphasized an MBO philosophy for self-help
13   Control has to be flexible.
14   Control helps management in knowing which department needs less attention.
15   Under planning targets of each department need not be compared with targets of all other departments.

Ans.   (1)(F), (2)(T), (3)(T), (4)(T), (5)(F), (6)(T), (7)(T), (8)(T), (9)(T), (10)(T), (11)(F), (12)(F), (13)(T), (14)(F), (15)(F)

(b) **Multiple Choice Questions:**

1   Which of the following pairs of the administrative thinkers have described the scientific management as the psychological organization theory?
     (a)   Simon and Argyris
     (b)   Simon and Likert
     (c)   March Barnard
     (d)   March and Simon

2   Who described the classical approach as the engineering approach?
     (a)   Gullick
     (b)   Fayol
     (c)   Urwick
     (d)   Mooney

3   Human Relations theory does not lay emphasis on
        (a)   Principles
        (b)   People
        (c)   Human Motivation
        (d)   Informal group functions

4   An efficient supervisor should posses
        (a)   Technical skills
        (b)   Conceptual skills
        (c)   Human relation skills
        (d)   All the above

5   Find the odd one out:
        (a)   Human relation theory
        (b)   Informal functioning
        (c)   Humanistic theory
        (d)   Structural theory

6   The scientific management theory oversimplified the workers
        (a)   Development
        (b)   Imagination
        (c)   Motivation
        (d)   None of the above

7   Management is purposeful and what?
        (a)   Objective
        (b)   Progressive
        (c)   Goal oriented
        (d)   Universal

8   Management exists at which levels of the organization?
        (a)   Top
        (b)   Bottom
        (c)   Middle
        (d)   All

9   Professional managers help organizations in chalking out which type of strategies?
        (a)   Multidisciplinary
        (b)   Competitive
        (c)   Corporate
        (d)   Academic

10   In addition to Place, Labor and Money which other internal environment Factor
        influences Management?
        (a)   Technology
        (b)   Machines

(c)   Scientists

(d)   Professionals

11   The following four different approaches to management thinking were developed in the first half of the 20th century:
(a)   Scientific management, general administrative, quantitative, and   contingency approach.
(b)   Scientific management, general administrative, quantitative, and organizational behavior.
(c)   General administrative, globalization, organizational behavior, and quantitative.
(d)   Systems approach, scientific management, general administrative, and organizational behaviour.
(e)   Scientific management, Hawthorne Studies, quantitative, and organizational behaviour.

12   When we classify managers according to their level in the organization they are described as_____.
(a)   Functional, staff and line managers
(b)   Top managers, middle managers and supervisors
(c)   High level and lower level managers
(d)   General managers and administrative managers

13   Frederick Taylor and Frank and Lillian Gilbreth were advocates of an approach to management involving the use of scientific method, known as:
(a)   The quantitative approach.
(b)   Management science.
(c)   Scientific management.
(d)   The contingency approach.

14   Authority, discipline, unity of command, and unity of direction are:
(a)   Taylor's four principles of management.
(b)   Principles of the human relations movement.
(c)   Elements of Weber's ideal bureaucratic structure.
(d)   Four of Fayol's fourteen principles of management.

15   Some of the other fields of study that affect management theory or practice include:
(a)   Political science, philosophy, anthropology and sociology
(b)   Zoology, psychology, sociology and philosophy.
(c)   Anthropology, astrology, political science and psychology.
(d)   Political science, sociology, typography and economics.

16   The philosophy of management known as total quality management developed primarily out of the work of:
(a) Henri Fayol
(b) Frederick Taylor
(c) Robert McNamara

(d) W. Edwards Deming

17   Possibly the most important pre-20th century influence on management was:
(a) Therbligs
(b) The industrial revolution.
(c) Scientific management.
(d) The division of labor.

18   Division of labor, authority hierarchy, formal selection, formal rules and regulations, impersonality, and career orientation are all features of:
(a) Weber's ideal type bureaucracy.
(b) General administrative theory.
(c) Fayol's principles of management.
(d) Taylor's principles of management.

19   The main influence on the behavioral science theories were:
(a) Psychology and sociology.
(b) Sociology and bureaucracy.
(c) Sociology and science.
(d) Bureaucracy and psychology.

20   Consider the following statements
1.   The terms 'Administration' and 'Management' are synonymous.
2.   Administration is a wider term than Management.
3.   Management is a wider term than Administration.
4.   Management is a narrower term than Administration.
5.   Administration encompasses activities like the sel1ing out of policies and objectivities, designing the organizational structure etc.
6.   Management is concerned with those operations leading an organization. towards success with is the broader framework set up by Administration.
Select the correct codes:
(a) 1, 2, 5 and 6
(b) 2, 4, 5 and 6
(c) 3, 4, 5 and 6
(d) 2, 3, 4, 5 and 6

21   Which one of the following is NOT the main concern of 'Scientific Management'?
(a) Production
(b) Efficiency
(c) Mechanistic Methods
(d) Rationality

22   Which one of the following concepts are not associated with Scientific Management?
(a) Mental Revolution
(b) Unity of Command
(c) Time and Motion Study

(d) Differential Piece rate plan

23 _____ concluded that managers perform 10 interrelated activities that relate to decision making, using information and interpersonal relationships.
  (a)   Mintzberg
  (b)   Abraham Maslow
  (c)   Robert Owen
  (d)   Henri Fayol

24 _____ maintains self developed network of outside contacts and informers who provide favors and information.
  (a)   Entrepreneur
  (b)   Monitor
  (c)   Liaison
  (d)   Figurehead

25 _____ roles involve people and other duties that are ceremonial and symbolic in nature.
  (a)   Informational.
  (b)   Interpersonal.
  (c)   Decisional.
  (d)   All of the given options

26 Which of the following is NOT an interpersonal role of a manager?
  (a)   figurehead
  (b)   leader
  (c)   disseminator
  (d)   liaison

27 _____involve receiving, collecting, and disseminating information.
  (a)   Interpersonal roles
  (b)   Informational roles
  (c)   Decisional roles
  (d)   None of the given

28 Which of the following is not included in Decisional role of a manager?
  (a)   Entrepreneur
  (b)   Disturbance handler,
  (c)   Collecting
  (d)   Negotiator.

29 Which of the following is include in Informational role of a manager
  (a)   liaison
  (b)   disseminating information
  (c)   resource allocator

(d)   none of the given

30   Greeting visitors: signing legal documents is an example of
      (a) figurehead
      (b) leader
      (c) Liaison
      (d) None of the given

31   Performing virtually all activities that involve subordinates is an example of
      (a) figurehead
      (b) leader
      (c) Liaison
      (d) None of the given

32   Acknowledging mail, doing external board work, performing other activities that
involve outsiders all are examples of
      (a) figurehead
      (b) leader
      (c) Liaison
      (d) None of the given

33   Seeks and receives wide variety of internal and external information to develop
thorough understanding of organization and environment is a function of
      (a) Monitor
      (b) Disseminator
      (c) Spokesperson
      (d) None of the given

34   If a manager takes parts in an Union negotiation then he/she is performing a _____
role.
      (a) Interpersonal roles
      (b) Informational roles
      (c) Decisional roles
      (d) None of the given

35   If a manager gives information regarding organization policies and actions then he/she
is performing an _____ role.
      (a) Interpersonal
      (b) Informational
      (c) Decisional
      (d) None of the given

36   The central principle which derives from McGregor's Theory is:
      a. Directional and control
      b. Co-ordination
      c. Scalar Principle

d. Integration

37   Which of the following is not a basic function of the management process?
      (a) Controlling
      (b) Organizing
      (c) Working
      (d) Leading

38   Conceptual skills relate to a manager's ability to
      (a) Take a strategic view of how parts of the organization function
      (b) Solve detailed problems in groups
      (c) Correctly evaluate organizational problems
      (d) Understand and interact effectively with others in the organization

39   Which of the following functions or activities requires recruiting and placing qualified
      personnel needed for the organization so that it may achieve its objectives and goals?
      (a)   Planning
      (b)   Staffing
      (c)   Organizing
      (d)   Controlling

40   Who studied the nature of specific jobs, and broke the tasks into basic work units with
      the end result providing the one right way to perform the job?
      (a)   Douglas M. McGregor
      (b)   Frederick W. Taylor
      (c)   Henry L. Gantt
      (d)   Henry L. Gantt

41   In the past three to four decades, many management theorists, and writers have made
      remarkable contribution in the study of management. By studying the various
      approaches to management analysis, we can understand the concept of management
      and have a better understanding of managerial functions. Which approach to
      management emphasizes managing people by understanding their individual
      psychological needs?
      (a) Empirical Approach
      (b) Decision Theory Approach
      (c) Management Science Approach
      (d) Interpersonal Behavior Approach
      (e) Contingency Approach.

42.   The communication process is made up of various components. Which of the following
      is the actual physical product from the source?
      (a) Feedback
      (b) Filter
      (c) Message
      (d) Channel

(e) Understanding

43. Which of the following would not be an accurate depiction of the differences between strategic and tactical planning?
   (a) Strategic planning is developed mainly by upper-level management and tactical planning is generally developed by lower-level management
   (b) Facts for strategic planning are generally easier to gather than facts for tactical planning
   (c) Strategic plans generally contain less detail than tactical plans
   (d) Strategic plans generally cover a longer period of time than tactical plans
   (e) Managers who are engaged in the development of strategic plans tend to work in more uncertainty than those managers engaged in the development of tactical plans.

44. Which of the following statements concerning grapevine is not correct?
   (a) Grapevine is generally used irregularly in organizations
   (b) Grapevine can and often does generate harmful rumors
   (c) Grapevine is used largely to serve the self-interests of people within it
   (d) Some managers use grapevine to their advantage
   (e) In time, and with proper pressure, grapevine can be eliminated.

45. The conflict-resolution approach that corresponds with a high level of assertiveness and a low level of cooperativeness, is referred to as
   (a) Compromising
   (b) Collaborating
   (c) Forcing
   (d) Avoiding
   (e) Accommodating.

46. Mr. Sunil works for "Energy Engineering Works." Apart from the regular compensation, the company provides him with things such as tuition reimbursement, recreational opportunities etc. What is the name given to these things of value?
   (a) Incentives
   (b) Benefits
   (c) Rewards
   (d) Compensation
   (e) Social benefits.

47. The fact that 70-80 percent of a manager's time is taken up by his interactions with others, highlights the need for effective communication for successful management. Which of the following strategies is not likely to improve communication effectiveness?
   (a) Avoiding non-verbal cues
   (b) Using simple, unambiguous language
   (c) Using active listening techniques
   (d) Using appropriate and consistent nonverbal cues
   (e) Using the feedback loop in the communication process.

48. Two factor theory of motivation provides useful insights into the relationship between individual and situational or hygiene factors. Which of the following is a hygiene factor?
   (a) Achievement
   (b) Interpersonal relations
   (c) Recognition
   (d) Challenging work
   (e) Increased responsibility.

49. Identify the sequence of different steps in controlling.
   I.   Measurement of performance.
   II.   Comparison of actual and standard.
   III. Analysis of causes of deviation.
   IV.   Actual performance.
   V.   Corrective action plan.

   (a) (III), (IV), (V), (I), (II)
   (b) (II), (III), (IV), (V), (I)
   (c) (I), (II), (IV), (III), (V)
   (d) (IV), (I), (II), (III), (V)
   (e) (V), (IV), (III), (II), (I)

50. JIT (Just-In-Time) inventory control is an approach to inventory control, which stipulates that materials should arrive just, as they are needed, in the production process. Which of the following would generally not be associated with a successful JIT program, for the purpose of inventory control?
   (a) Well-organized receiving and handling of materials purchased from suppliers
   (b) Strong management commitment
   (c) Suppliers located in diverse and distant locations
   (d) High quality of materials purchased from suppliers
   (e) Dependable and long-lasting relationships with suppliers and customers.

Ans.   (1)(d), (2)(c), (3)(a), (4)(d), (5)(d), (6)(c), (7)(c), (8)(d), (9)(c), (10)(b), (11)(b), (12)(b), (13)(c), (14)(d), (15)(a), (16)(d), (17)(b), (18)(a), (19)(a), (20)(b), (21)(d), (22)(b), (23)(a), (24)(c), (25)(b), (26)(c), (27)(b), (28)(c), (29)(b), (30)(a), (31)(b), (32)(c), (33)(a), (34)(c), (35)(b), (36)(d), (37)(c), (38)(a), (39)(b), (40)(b), (41)(d), (42)(c), (43)(b), (44)(e), (45)(c), (46)(b), (47)(a), (48)(b), (49)(d), (50)(c)

Fill in the Blanks:

1. Chesterd Bernard developed a theory of organization and _____ functions.
2. The word_____denotes a function, a task, a discipline.
3. Organization as an establishment is considered as the _____ aspect of an enterprise.
4. To enhance emotional intelligence, _____ must refocus their training to include the limbic system.

5. The _____ principle, which is the inherent process in organization through which authority, the antecedent coordinative principle, permeates the entire organized structure.

Ans 1(Executive), 2 (management), 3 (Physical), 4 (Organisations), 5 (Scalar)

II   Short Answer Type Questions:

(a)   Explain the following:

1   The term management has no universal definition.
2   To perform managerial functions managers have to fit in many different roles.
3   Mathematical and statistical solutions are most effective in management decision making.
4   Organization is a system comprised of many sub-systems.
5   Economic objective of business
6   'Is management a profession'.
7   Levels of management
8   What is business.
9   What is meant by Social values?
10   What is the contribution of F.W Taylor to management thought.
11   What are the different types of managers.
12   Explain the different levels of management.
13   What is Management? Explain its nature.
14   Discuss roles and responsibilities of a manager.
15   Discuss importance of Ethics in Business.
16   Explain the findings of Hawthorne experiments.
17   What is the decision theory approach to management?
18   Clearly explain the significance of management. Distinguish between management and administration.
19   "Job enlargement and job enrichment are important means of motivating job-holders into achieve higher productivity and derive job satisfaction."Comment.
20   Distinguish between formal & informal communication.
21   Management is getting things done through other people. Is this definition adequate for the present day concept of management?

(b)   Differentiate between the following:

1   Management Vs Administration.
2   Conceptual skills and Technical skills
3   Unity of command Vs Unity of direction
4   Contingency Approach Vs Systems approach
5   Interpersonal and Informational role of manager.
6   Delegation of authority & Responsibility

III   Long Answer Type Questions:

1   What do you understand by management? Discuss the nature of management. "Management is the art of getting things done". Do you agree with the statement? Give reasons.
2   Explain the concept of management and bring out its importance in present-day context.
3   "Management is regarded as an art by some, science by others, and inexact science by many more. The truth seems to be somewhere in between". In light of this statement, explain the exact nature of management.
4   What is effective management? How does effectiveness differ from efficiency?
5   What are the four basic activities that comprise the management process? How are they related to one another?
6   Describe the process of management and explain how it can be used to accomplish results in any organization.
7   Enumerate the managerial skills and state their relative importance with regard to different levels of management in an organsation.
8   Discuss Henri Mintzberg's classification of basic roles performed by managers in organizations.
9   Contrast and compare classical, neo classical and modern approach to mgt.?
10   Discuss the contribution of Taylor and Fayol to the field of Management.
11   "Elton Mayo is known as the father of human relations school. In the light of this statement explain how the findings of Hawthorne experiments contribute to the human relation approach.
12   What do you understand by a system? Discuss management as a system bringing out its basic features as such.
13   "Scientific management involves in its essence complete mental revolution on the part of the workers and an equally complete mental revolution on the part of management". Examine this statement.
14   Explain how behavioral scientists modify the basic findings of 'Hawthorne Experiment'.
15   "Economic goals and social obligations of business are always in conflict with each other and cannot be reconciled". Comment.
16   Explain the social responsibilities of business towards its shareholders, customers and community at large.
17   Account for the growing concern among business about their social responsibilities. Do you think legal measures are sufficient to force or induce a company to discharge its social responsibilities?
18   Give reasons, why present-day business managers attach importance to social responsibilities.
19   What is the difference between the contingency and the universal perspective of management? How is the contingency perspective useful in the practice of management today?
20   "All organizations need management". Comment on this statements.
21   Write notes on the following:
     (a)   Nature & Significances of management

(b)   Management as a Profession.

22   What do you mean by 'Levels of Management'? Briefly describe the different levels of management.

23   Discuss Henry Mintzberg's classification of basic roles performed by Managers in Modern Organizations.

24   Write an explanatory note on the skills required by managers.

25   What functions and duties are associated with top & middle management in modern industrial unit? Explain briefly.

26   Who is a manager? What are the qualities of a successful manager?

27.   "The job of a supervisor is more difficult than that of higher level managers". Explain what are major functions of supervisor?

28.   What do you mean by multiple chief executive system? Discuss various functions performed by chief executives.

29.   Assess contributions of Barnard and Simon to the management thought.

30.   Management is the effective utilization of human and material resources to achieve the enterprise objectives." Discuss.

31   What do you understand by scientific approach to management? Describe the salient features of Taylor's scheme of scientific management and discuss their validity today.

32   "The emerging trend of separation of management from ownership and increasing professionalization of management has led to a debate as to whether or not management is a profession." Discuss.

33   "A good manager does not wait for things to happen, he makes them happen." Comment.

34   "Managers are not born." Elucidate.

35   Narayan Murthy of Infosys Technology is regarded as one of the best managers in India. Name the characteristics and behaviours that made Murthy so admired.

36   "A manager has many roles to play. Each of these roles demands a variety of skills". Discuss.

37   Why does technical skill become less important as a person rises in organizational hierarchy?

38   "The most useful method of classifying managerial functions is to group them around planning, organising, staffing, directing and controlling." Comment.

39   "Management is a complex functional concept of which the main elements are: Planning, Organising, Staffing, Directing, Coordinating, Reporting and Budgeting (POSDCORB). Discuss.

40.   If Taylor's scientific principles are still found in many work settings today, does this mean that management really has not changed in the last ninety years. Explain.

41   Management is both a science and an art. Explain this statement.

42   Discuss the human behavior approach to management .What are its contribution to the theory of management?

43   Do you suggest professionalization of management in India. Give arguments in favour of and against professionalization of management in India.

44   Is management the art of getting things done through and with people?

45   Management is a distinct process, consisting of planning, organizing, actuating and controlling performance to determine and accomplish objectives by the use of people

and resources." In the light of this definition, explain the meaning and significance of management.

46   "Management is concerned with ideas, things and people." Comment.
47   How would you argue that management is important for all organizations.
48   What are the skills and skill mixtures which managers at different levels need to possess.
49   Critically examine Hnery Mintzberg's Managerial roles approach to present day management.
50   How can organizations develop the competencies of their management.
51   Discuss the principles of management given by Henry Fayol.
52   Discuss the concept of social responsibility. Is it different from ethical behavior. Explain.
53   What managerial skills are required at different levels of management. explain taking examples for each level
54   Discuss the evolution of management in light of the early contributions.
55   Explain the social systems approach in detail.
56   Explain the skills required by a manager for getting things done from others.

UNIT - II
I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1   Organizations affect and get affected by the environment.
2   General environment is the same for all organizations in a given society.
3   Organizational Culture is the way people behave in an organisation, it can never be changed.
4   Modern business organizations have assumed more social responsibility than their older counterparts.
5   Organisational Culture can also become a liability.
6   Departmentalization means grouping the activities of an organization on the basis of different functions.
7   Vertical differentiation and integration results into establishment of hierarchy.
8   Responsibility cannot be delegated to others.
9   Mass activities have started in modern times .
10   There are three central ideas associated with consequentialism.
11   EQ was first brought to attention by Benott Simon
12   To avoid order and clarity there should be unity of command.
13   Management consultants do not assist implementation.
14   Frederick W. Taylor was born before Henry Fayol
15   Direction should not be a very continuous activity.

Ans.   (1)(T), (2)(T), (3)(F), (4)(T), (5)(T), (6)(F), (7)(T), (8)(T), (9)(F), (10)(F), (11)(F), (12)(F), (13)(F), (14)(F), (15)(F)

(b)   Multiple Choice Questions:

1   What is the term used to define the number of subordinates directly controlled by a manager?
(a)   Division management
(b)   Departmentation
(c)   Sphere of influence
(d)   Span of management

2   What kind of organizational structure combines a vertical chain of command with horizontal reporting requirements?
(a)   Line Authority
(b)   Matrix
(c)   Functional
(d)   Quality circle

3   Functional managers are responsible
(a)   For a single area of activity
(b)   To the upper level of management and staff
(c)   For complex organizational sub-units
(d)   For obtaining copyrights and patents for newly developed processes and equipment.

4   Which pattern reflects a pure executive form of management?
(a)   Functional
(b)   Line
(c)   Line and Staff
(d)   Committee

5   One of the factors which learning organizations possess is a climate of openness and the other factor is
(a)   Motivation
(b)   Closeness
(c)   Trust
(d)   Delegation

6   Organisational Culture is retained in organizations through
(a)   Stories
(b)   Rituals
(c)   Top Management
(d)   All the above

7   Which is not related to Indian Value System
(a)   Truth
(b)   Loyalty
(c)   Purity of Mind
(d)   Unforgiveness

8.   _____ plans have clearly defined objectives.
(a)   Directional
(b)   Flexible
(c)   Specific
(d)   Standing

9.   Strategic planning:
(a)   Addresses the organization's basic mission or business, issuing broad statements of purpose or direction that have a long lead time.
(b)   Involves managers in each unit of an organization who are responsible for achieving the unit's objectives within a specified period of time.
(c)   Looks specifically at resources, finances, and market conditions to determine ways to accomplish the overall plans of the organization.
(d)   Determines the day-to-day operations within an organization.

10.   The planning process can be used to promote_____ in organization
(a) Advancement
(b) Technologies
(c) Innovation
(d) Discoveries

11.   _____ reduces uncertainty
(a) Negotiating
(b) Planning
(c) Organizing
(d) Leading

12.   _____ are those plans that are extended beyond three years.
(a) Short Term Plans
(b) Long Term Plans
(c) Specific Plans
(d) Strategic Plan

13.   Identify the best definition of planning.
(a) Setting an organisation's objectives and the means of reaching them.
(b) An integrated process in which plans are formulated, carried out and controlled.
(c) The core activity of planners and planning departments.
(d) Devising ways of achieving the objectives of an organisation.

14.   Identify three levels of planning.
(a) Top, middle and bottom
(b) Headquarters, divisional and local
(c) Operational, intermediate and strategic
(d) Strategic, administrative and functional

(e) None of the above

15. What is the planning horizon?
    (a) The maximum time for which managers can make plans.
    (b) The time period within which uncertainty is very low.
    (c) The time between making a plan and putting it into effect.
    (d) The time ahead for which there is no information.
    (e) The distance ahead for the forecasts on which plans are made.

16. i) A good objective should clarify the desired result;
ii) enable achievement to be measured; and
iii) need not specify a time scale.
Which of these statements is true?
    (a) (i)only
    (b) All of them
    (c) (i) and (ii)
    (d) (i) only.
    (e) (iii) only

17. What is the more formal term for what is known as 'Plan B'?
    (a) A catastrophe plan
    (b) A crisis plan
    (c) A contingency plan
    (d) A calamity plan
    (e) A circumstantial plan
    (f) A convergence plan

18. "Developing plans to integrate and coordinate activities "is include in ------------
    (a) Organizing
    (b) leading
    (c) Controlling
    (d) Planning
    (e) Assurance

19. _____ goals and plans typically involve time periods of 1 to 3 years.
    Strategic
    (a) Tactical
    (b) Operational
    (c) none of the given options

20. _____ goals and plans can be for as short a period as 1 week or as long as 1 year.
    (a) Strategic
    (b) Tactical
    (c) Operational

21.   Desired outcomes for individuals groups or entire organizations.
   (a)   goals
   (b)   plans

22.   Formal & informal are two types of _____.
   (a)   Planning
   (b)   Organizing
   (c)   Leading
   (d)   Controlling

23.   In _____ planning nothing is written down & there is little or no sharing of
        goals with others in organization.
   (a)   formal
   (b)   informal

24.   _____ planning is general and lacks continuity.
   (a)   formal
   (b)   informal

25.   A _____ is a broad declaration of the basic unique purpose and scope of
        operations that distinguishes the organization from others of this type.
        (a) mission statement
        (b) bank statement
        (c) financial statement
        (d) none of the given options

26.   _____ plans are those that are organization wide establish overall objectives
        and position an organization in terms of its environment.
   (a)   Strategic
   (b)   Operational plans
   (c)   Short-term plans
   (d)   Specific plans

27.   _____ plans are plans that specify details on how overall ob jectives are to be
        achieved.
   (a)   Strategic
   (b)   Operational
   (c)   Specific
   (d)   Directional

28.   _____ goals and plans generally involve time periods of 3-5 years.
   (a)   Strategic
   (b)   Tactical
   (c)   Operational
   (d)   none of the given options

29. A process of setting mutually agreed-upon goals and using those goals to evalute employee performance.
   (a)   Management by objectives(MBO)
   (b)   planning
   (c)   Well-Designed goals
   (d)   none of the given options

30. When the hierarchy of objectives is clearly defined it forms an integrated _____ in which higher-level objectives are linked to lower-level objectives.
   (a)   means-end chain
   (b)   Traditional goal setting
   (c)   self-confidence
   (d)   none of the given options

31. Inappropriate goals may lead to _____.
   (a)   Dishonesty and cheating
   (b)   shot-range thinking
   (c)   self-confidence
   (d)   stress

32. Setting difficult goals increases the _____ that they will not be reached.
   (a)   risk
   (b)   stress
   (c)   dishonesty and cheating
   (d)   self-confidence

33. Failure to meet high goals may undermine the _____ of organizational members.
   (a)   self-confidence
   (b)   dishonesty and cheating
   (c)   stress
   (d)   risk

34. MBO consists of _____ elements:
   (a)   two
   (b)   three
   (c)   four
   (d)   five

35. MBO was first described by _____.
   (a)   Peter Drucker
   (b)   P. Robbins
   (c)   Mary Coulter
   (d)   none of the given options

36. _____ plans are plans that cover one year or less.
    (a)   Short-term
        (b) Long-term
        (c) Specific
        (d) Directional

37. Decision-making model consists of four styles: directive, analytic, behavioral and_____.
    (a)   Conceptual
    (b)   Intuitive
    (c)   Group interaction
    (d)   Laggard

38 i) A good objective should clarify the desired result;
    ii) enable achievement to be measured; and
    iii) need not specify a time scale.
    Which of these statements is true?
        (a)   (iii) only
        (b)   (ii) only
        (c)   (i) and (ii)
        (d)   All of them

39 What are three problems commonly hindering successful planning?
    (a)   Lack of planning expertise; little top management support; misuse of planning specialists.
    (b)   Conflict among objectives; impossibility of measuring outcomes; confusion between means and ends.
    (c)   An oversized planning department; poor co-operation between managers and planners; managers with little time to gather information.
    (d)   Procedures unsuited to change; negative organisational culture; poor interpersonal relationships.

40 Which of the following does not from part of the several internal benefits of objectives, goals and a sense of mission.
    (a)   Basis of control
    (b)   Basis to resolve disputes
    (c)   Motivation
    (d)   None of the above.

41. Information that originates outside the organization is known as external information. Which of the following is/are example(s) of external information in an organization?
    (a) Daily receipts and expenditures
    (b) Salesperson Quotas
    (c) Descriptions of customer satisfaction with products and services
    (d) Quantity of an item in hand or in inventory
    (e) Cost and selling price of the company's item.

42. Which of the following decision-making models emphasizes short-run solution of a problem rather than long-term goal accomplishment?
(a) Rational model
(b) Satisficing model
(c) Incremental model
(d) Garbage-can model
(e) Decision tree.

43. Sofia works in one of seven research and development departments at General Automobile Corporation. This would suggest that General Automobiles has a
(a) Functional structure
(b) Divisional structure
(c) Flat structure
(d) High degree of centralization
(e) Tall structure

44. Which of the following information processing systems gives the output in the form of summary and exception reports that are useful to the managers?
(a) Decision support system
(b) Management information system
(c) Office automation system
(d) Transaction processing system
(e) Executive support system.

45. In which of Likert's four systems of leadership, managers do not have complete confidence and trust in subordinates but nevertheless, solicit advice from subordinates while retaining the right to make final decision?
(a) Participative leadership style
(b) Benevolent-authoritative leadership style
(c) Consultative leadership style
(d) Exploitative-authoritative leadership style
(e) Trait theory of leadership style.

46. Performance appraisals are important in an organization because they
I. Provide systematic judgments to support promotions.
II. Provide a basis for coaching.
III. Provide a basis for counseling.
IV. Let subordinates know where they stand with the boss.

(a) Only (I) above
(b) Only (II) above
(c) Both (I) and (IV) above
(d) (I), (III) and (IV) above
(e) All (I), (II), (III) and (IV) above.

47.	Ratio analysis helps a manager to compare the performance of the organization with its previous performance or the performance of its competitors. Which of the following is a ratio of creditors' contribution to that of the owners?
(a) Current ratio
(b) Debt-equity ratio
(c) Return on investment (ROI)
(d) Net profit margin
(e) Inventory turnover

48.	Which of the following inventory techniques uses cards to monitor inventory movement?
(a) ABC Analysis
(b) JIT Approach
(c) Kanban
(d) Kaizen
(e) Economic Order Quantity.

49.	A decision support system (DSS) is an interactive computer system used to plan and make decisions. Which of the following is/are true with regard to Decision Support System (DSS)?
I.	Executive decisions are the focal points in DSS.
II.	DSS specializes in easy-to-use software.
III.	DSS employs interactive processing.
IV.	The control and use of DSS rests with the central information management department.

(a) Only (I) above
(b) Both (I) and (II) above
(c) Both (III) and (IV) above
(d) (I), (II) and (III) above
(e) (II), (III) and (IV) above

50.	Which of the following is/are postulates of the path – goal theory?
I.	The leader clearly defines the path to goal attainment for subordinates.
II.	The leader motivates subordinates to participate in decision-making.
III.	The leader sets clear and specific goals for subordinates.
IV.	The leader suitably rewards employees as per their performance.

(a) Only (II) above
(b) Only (IV) above
(c) Both (II) and (IV) above
(d) (I), (II) and (IV) above
(e) All (I), (II), (III) and (IV) above.

Ans.	(1)(d), (2)(b), (3)(a), (4)(a), (5)(c), (6)(d), (7)(d), (8)(a), (9)(c), (10)(c), (11)(b), (12)(b), (13)(b), (14)(d), (15)(c), (16)(c), (17)(c), (18)(d), (19)(a), (20)(c), (21)(a), (22)(a),

(23)(b), (24)(b), (25)(a), (26)(a), (27)(b), (28)(a), (29)(a), (30)(a), (31)(a), (32)(a), (33)(a), (34)(c), (35)(d), (36)(a), (37)(a), 38(c), 39(a), 40(b), (41)(c), (42)(c), (43)(b), (44)(b), (45)(c), 46(e), 47(b), 48(c), 49(d), 50(e)

Fill in the blanks:

1. _____, weakness, threats, opportunities are the long form SWOT analysis.
2. _____ is the specialization where the economists consider necessary for efficiency in the use of labour.
3. Advantage of delegation of authority results in prompt _____.
4. Business _____ is the calculation of probable events to provide against future.
5. _____ behaviour is obtained when there is a one-way transmission of orders from superior to subordinates.

Ans.1 (strength), 2(Division of work), 3(Decision-making), 4(forecasting), 5 (Linear)

II   Short Answer Type Questions:

(a)   Explain the following:

1   An effective manager can change organization culture.
2   The dependence and influence between an organization and external environment are reciprocal to a very large extent.
3   Many conflicts between line and staff managers occur due to identifiable reasons.
4   Elaborate planning as a pervasive function of management.
5   There is no alternative to planning. Discuss this statement.
6   What are the elements of delegation.
7   Explain the characteristics of line and staff organization.
8   Explain the concept of business forecasting.
9   What do you understand by planning premises.
10   State the principles of planning.
11   Explain the nature of planning.
12   What do you understand by departmentation.
13   Write a short note on span of control.
14   What are the characteristics of authority.
15   Why is delegation important.
16   Explain the concept of corporate social responsibility & role of ethics in business.
17   Explain the external & internal forces for organizational changes.

(b)   Differentiate between the following:

1   Organisational culture and Climate
2   Project organsiation and Matrix organization
3   Authority and Responsibility
4   Centralization and Decentralization
5   Objectives and Policies

6	Policies and Procedures
7	Policies and Rules
8	Strategies and Tactics

III   Long Answer Type Questions:

1   Discuss the various characteristics and functions of management.

2   What is management called a process? Briefly explain the component of managerial process.

3   To mange is to forecast and plan to organize, to command, to coordinate and to control". Elaborate this statement.

4   What do you understand by planning function of management? Explain the importance of planning in organization?

5   Elaborate the characteristics and process of planning.

6   What do you mean by decision making? Explain the process of decision making?

7   What is forecasting? Explain the various methods involved in forecasting?

8   Define the network approach to departmentalization. Also enumerate its merits and demerits?

9   "Just as authority is the key to the managerial job, delegation of authority is the key to organisation" Discuss with special reference to the fundamental principles of delegation?

10   Describe in detail about Project Organisation.

11   State and explain the common causes of conflict between line and staff managers in an organisatiion.

12   What do you understand by matrix organsation? Under what circumstances is it most useful? Differentiate it from project organization.

13   Many executive wants to delegate there function but do not know just how to do it? Suggest some guidelines to help such executives in deciding what to delegate and what not to delegate?

14   Explain span of management .Do you agree with the view that the principle of "Unity of command" is not of much relevance these days?

15   "Centralization is not necessarily bad, nor is decentralization necessarily good". Elucidate the statement.

16   Explain the concept of organsational culture. What are the different types of organsational culture?

17   Explain the various stages of socialization process. What is the effect of organizational culture on turnover, abseentism and productivity?

18   "Creation of organizational culture is a long-term process". Explain and discuss the process involved in creating organizational culture.

19   Discuss the various characteristics and functions of management.

20   What is management called a process? Briefly explain the component of managerial process.

21   "Planning is the primary requisite of every management function whether it is organizing, staffing, directing or controlling." Discuss planning in the context of the said statement. Also, give benefits of efficient planning.

22. Compare line, functional and line and staff organizations. Which of these will be appropriate for a large organization?
23. "Planning is a mere ritual in a fast changing environment." Comment.
24. "Planning is the primary requisite of every management function whether it is organizing, staffing, directing or controlling." Discuss and define planning. Also, give the benefits of efficient planning.
25. Planning is waste of time and money. Comment.
26. 'Decision making involves choice from among alternative solutions." Comment.
27. Groups always make better decisions than individuals. Comment.
28. "The management of every enterprise has to evolve its own organization structure the form of which mainly depends upon the activities of the business, competence of personnel and the philosophy of management." Discuss and give popular types of organization.
29. "Despite their shortcomings, committees are an important device for management." Critically examine this statement.
30. Why lone people do not cooperate with staff experts? How can the two be made to work together harmoniously.
31. Define corporate planning. Explain briefly various types of corporate planning.
32. Explain the meaning of organization as a structure and state briefly its principles.
33. What do you mean by span of control? Explain Graicunas theory of span of control.
34. What are the obstacles in delegation of authority. What steps must be taken to make delegation more effective.
35. Discuss the role of planning in a modern business organization. Enumerate the steps involved in the planning process.
36. Define planning. Discuss the limitations of planning. What measures do you suggest to overcome these limitations.
37. "Planning is the basis for control." Comment.
38. What is economic forecasting. Explain the various techniques of economic forecasting.
39. "Effective forecasting precedes planning." Comment.
40. What is organizational structure? Why is it required? Explain matrix organizational structure.
41. Explain the concept of span of control with the help of an example of an organization.
42. Explain the concept of delegation. Discuss the principles associated with it.
43. "Authority and responsibility go hand in hand. One is incomplete without the other." Explain.
44. Explain the different forms of organisation structure. Give example of an industry for each of them.

UNIT - III

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1. In Division of work, economists consider necessary for efficiency in the use of labour.
2. It is possible to make a permanent change in the behaviour of person.

3.   Money alone can motivate employees to put in best performance.
4.   A psychological test or selection test is designed to measure selected psychological factors.
5.   Collective bargaining is done with the object of reaching an agreement between the parties.
6.   Delegation of authority does not allow subordinate to develop
7   Economic considerations do not affect the choice of span.
8   Event management is a modern activity.
9   The objective of paternalistic leadership to help, guide, protect followers.
10   Delegation and decentralization are closely related
11   Necessary rigidity is required in the control design.
12   The 3-needs theory is about motivators in an organization.
13   Service sector has expanded because of explosion in information technology.
14   There are five channels through which corporate governance may bear.
15   An SBU is a relatively independent business unit.

Ans-(1)(T), (2)(T), (3)(F), (4)(T), (5)(T), (6)(F), (7)(F), (8)(T), (9)(T), (10)(T), (11)(F), (12)(T), (13)(T), (14)(T), (15)(T)

(b)   Multiple Choice Questions:

1.   Name the specialization where the economists consider necessary for efficiency in the use of labour :-
      a) Division of task
      b) Division of man power
      c) Division of techniques
      d) Division of work

2   According to Herzberg, which of the following is a maintenance factor?
      (a)   Salary
      (b)   Work itself B
      (c)   Responsibility
      (d)   Recognition

3   The purpose of job enrichment is to
      (a)   Expand the number of tasks an individual can doA
      (b)   Increase job efficiency
      (c)   Increase job effectiveness
      (d)   Increase job satisfaction of middle management

4   The process, which is aimed at seeking change in attitudes, stereotypes and perceptions, that groups hold of each other is called
      (a)   Organizational development
      (b)   Inter-group development
      (c)   T-groups
      (d)   Team-building

5. Job analysis deals with
  (a) Job description and Job Specification
  (b) Job description
  (c) Manpower Planning
  (d) Recruitment and Selection

6. Job description provides information about
  (a) Nature of job
  (b) Nature of person performing the job
  (c) Nature of the department
  (d) Nature of the organisation

7. Job specification provides information about
  (a) Nature of the job
  (b) Nature of person performing the job
  (c) Nature of the department
  (d) Nature of the organisation

8. The responsibility of staffing lies with
  (a) Personnel Department
  (b) Finance Department
  (c) Marketing Department
  (d) Productions Department

9. While recruiting a person, managers
  (a) invite applications from candidates
  (b) select them for the job
  (c) place them at the right job
  (d) train them for the right job

10. The best match between job description and job specification is
  (a) Recruitment
  (b) Selection
  (c) Job Analysis
  (d) Both recruitment and selection

11. An interview which is planned and based on pre-determined list of questions is
  (a) Structured interview
  (b) Unstructured interview
  (c) Semi-structured interview
  (d) Effective interview

12. Personal contacts and references are the sources of
  (a) Internal recruitment
  (b) External recruitment

13. Employment exchange and trade unions are the sources of
   - (a) Internal recruitment
   - (b) External recruitment

14. On-the-job training
   - (a) disturbs work schedules
   - (b) does not disturb work schedules

15. Appropriate form of training where large number of employees is involved is
   - (a) On-the-job training
   - (b) Off-the-job training

16. Training employees while they are performing the job is known as
   - (a) On-the-job training
   - (b) Off-the-job training

17. It makes people skilled to perform present and future jobs
   - (a) Training
   - (b) Development
   - (c) Compensation
   - (d) Performance Appraisal

18. Wages are paid to workers on the basis of individual or group output in
   - (a) Piece rate system
   - (b) Time rate system

19. The appraisal system relevant for promotion decision is
   - (a) Grading system
   - (b) Graphic scales
   - (c) Potential appraisal

20. _____ need involves the desire to affiliate with and be accepted by others.
   - (a) Esteem
   - (b) Belongingness
   - (c) Safety
   - (d) Self Actualization

21. Needs that impel creativity and innovation, along with the desire to have a productive impact on our surroundings are_____ needs.
   - (a) Existence
   - (b) Relatedness
   - (c) Growth
   - (d) None of the Above

22. ERG theory was introduced by_____.
   - (a) Clayton Alderfer

(b) McClelland
(c) Douglas McGregor
(d) J. Stacey Adams

23. _____ is counter to goal-setting theory.
    (a)   Expectancy Theory
    (b)   Reinforcement Theory
    (c)   ERG Theory
    (d)   None of given option

24. Surroundings are_____ needs.
    (a)   Existence
    (b)   Relatedness
    (c)   Growth
    (d)   None of the Above

25. Challenging goals usually lead to_____ performance from individuals and groups.
    (a)   Higher
    (b)   Lower
    (c)   Excellent
    (d)   None of the Above

26. The theory that an individual tends to act in a certain way, with the expectation that the act will be followed by a given outcome and according to the attractiveness of the outcome is_____.
    (a) Equity theory
    (b) Three-needs theory
    (c) Motivation-hygiene theory
    (d) Expectancy theory

27. Which of the following statements would a Theory X manager consider to be true?
    (a)   The average person can learn to accept and even seek responsibility
    (b)   Employees will shirk responsibility
    (c)   Employees will exercise self-direction if they are committed to the objectives
    (d)   Employees view work as being as natural as play

28. Which management theorist is responsible for the motivation-hygiene theory?
    (a)   Abraham Maslow
    (b)   Dale Hawthorne
    (c)   Peter Drucker
    (d)   Frederick Herzberg

29. According to Abraham Maslow, the most elevated type of need is_____.
    (a)   Self-actualization

(b)   Physiological
(c)   Esteem
(d)   Safety

30.   Ali is working in XYZ Company, he desires to get himself secure from crimes,
        company lay offs and other adverse impacts. We can say that he fulfils the _____
        need.
        (a)   Self Actualization
        (b)   Social need
        (c)   Esteem
        (d)   Safety

31.   In-------------- theory management assumes that employees may be ambitious, self-
        motivated, and anxious to accept greater responsibility, and exercise self-control, self-
        direction, autonomy and empowerment.
        (a)   Theory Y manager
        (b)   Theory X manager
        (c)   Theory Z manager
        (d)   All of the above

32.   _____ need involves the desire to affiliate with and be accepted by others.
        (a)   Esteem
        (b)   Belongingness
        (c)   Safety
        (d)   Self-Actualization

33.   Seema desires for friendship, love, and a sense of belonging, we can say that she fulfils
        the_____
        (a)   Physical need
        (b)   Self Actualization
        (c)   Social need
        (d)   Esteem

34.   If the average human being prefers to be directed, wishes to avoid responsibility, has
        relatively little ambition and wants security above all, the management attitude would
        be:
        (a)   Theory Y manager
        (b)   Theory X manager
        (c)   Theory Z manager
        (d)   All of the given options

35   Staffing policies and procedures can help to increase _____.
        (a)   employee perceptions of procedural justice
        (b)   consistency in operations
        (c)   legal compliance and equal employment opportunity
        (d)   all of the above

36   The availability of data for evaluating the effectiveness of HR activities has been
        _____ over time because of the adoption of HRIS.
        (a)   increasing
        (b)   decreasing
        (c)   staying about the same
        (d)   fluctuating about a steady average

37   Acquisition activities involve all of the following except
        (a)   External staffing systems
        (b)   Deploying staff for maximum usefulness for the organization
        (c)   Initial intake of applicants into the organization
        (d)   Planning for the numbers of people needed
        (e)   Establishing the types of rewards the job will provide

38   Staffing systems should be used primarily to
        (a)   Hire the best and brightest candidates
        (b)   Contribute to organization survival, profitability and growth
        (c)   Reduce the chance of legal difficulties for the employer
        (d)   Balance the needs of employees and the employer

39   Core staffing activities include all of the following except
        (a)   Job analysis
        (b)   Recruitment
        (c)   Selection
        (d)   Employment

40   Part of the matching process is to match _____ to _____ .
        (a)   KSAOs, motivation
        (b)   Intrinsic rewards, pay and benefits
        (c)   Job rewards, individual motivation
        (d)   Job analysis, retention strategy

41   Behaviorally Anchored Rating Scales (BARS) is a sophisticated performance rating
        method. Which of the following is not true with regard to BARS?
        (a)   BARS minimizes subjective interpretation inherent in graphic rating scales
        (b)   BARS makes use of 'anchors' (common reference points of performance)
        (c)   BARS concentrates on job-specific behaviors and hence is highly meaningful
        (d)   BARS is a simple and cost-effective rating method
        (e)   BARS can be applied in organizations where a large number of people perform
                similar jobs.

42.   Which of the following is not true with regard to functional authority?
        (a)   Functional authority is the authority staff members have over line members
                within the   limits of their functions

(b)   Functional authority has the same effect as line authority but it doesn't have the right that line authority has, to punish violations or deviations in order to ensure compliance

(c)   Functional authority is limited to those areas where a staff member has some technical competence

(d)   The use of functional authority should be restricted to the procedural aspects of a function

(e)   Functional authority is in sync with the principle of unity of command.

43.   Creativity is an important factor in managing people. Which of the following is not true with regard to the creative process?
(a) Creativity is the ability to develop new ideas
(b) The creative process starts with unconscious scanning
(c) Intuition connects the unconscious with the conscious
(d) Insight leads to intuition
(e) Insight is tested against organizational reality.

44.   According to "expectancy theory", the probability of an individual acting in a particular way depends on
I.   The personality of the individual and the likelihood it will change.
II.   The company and its potential to be moving in the right direction.
III.   The situation.
IV.   The strength of that individual's belief that the act will have a particular outcome and on whether the individual values that outcome.
(a) Only (I) above
(b) Only (IV) above
(c) Both (I) and (III) above
(d) Both (II) and (IV) above
(e) (I), (III) and (IV) above.

45.   Which of the following techniques for improving productivity aims at reducing costs by analyzing and improving individual operations of a product or service?
(a) Work simplification
(b) Time-event network
(c) Value engineering
(d) Total Quality Management
(e) Quality Circle.

.46.   Span of control an important factor, which is to be taken into account when undertaking organizational design. Maintaining a large span of control within an organization is most effective in all except one of the following situations?
(a) When subordinates prefer autonomy
(b) When tasks are routine
(c) When jobs are similar but have varying performance measures
(d) When subordinates are highly trained
(e) When managers are competent.

47. Functional job analysis is a widely used systematic job analysis approach. Which of the following dimensions of an individual's job does functional job analysis focus on?
   I. Data, people and jobs pertaining to the individual's job.
   II. Interpersonal relationships required to perform the job.
   III. Tools and equipment used by the worker.
   IV. Products and services produced by the worker.
   (a) Only (I) above
   (b) Only (III) above
   (c) Both (II) and (IV) above
   (d) (I), (III) and (IV) above
   (e) All (I), (II), (III) and (IV) above.

48. Organizational culture is the collection of shared values, beliefs, rituals, stories, myths and specialized language that foster a feeling of community among organization members. Which of the following is not a characteristic of organization culture?
   (a) It differentiates one organization from another
   (b) It defines the internal environment of an organization
   (c) It ensures consistency in the behavior of organization members
   (d) It remains absolutely stable throughout the life of an organization
   (e) It is perceived by the organization members as well as by outsiders.

49. Management By Objectives (MBO) is a system for achieving organizational objectives, enhancement of employee commitment and participation. Which of the following is not an advantage of MBO?
   (a) Role clarity
   (b) Clarity in organizational action
   (c) Personnel satisfaction
   (d) Basis for organizational change
   (e) Flexibility.

50. Which of the following are the characteristics of the planning process usually adopted in Japanese Management style?
   I. Long-term orientation.
   II. Individual decision-making.
   III. Decisions flowing from bottom to top and back.
   IV. Slow decision-making.
   (a) Both (I) and (II) above
   (b) Both (I) and (III) above
   (c) Both (II) and IV) above
   (d) (I), (III) and (IV) above
   (e) (II), (III) and (IV) above.

Ans-(1)(d), (2)(b), (3)(a), (4)(c), (5)(a), (6)(a), (7)(b), (8)(a), (9)(a), (10)(b), (11)(a), (12)(a), (13)(b), (14)(a), (15)(b), (16)(a), (17)(b), (18)(a), (19)(c), (20)(b), (21)(c), (22)(a), (23)(b), (24)(c), (25)(a), (26)(a), (27)(b), (28)(d), (29)(a), (30)(d), (31)(a), (32)(b), (33)(c), (34)(b),

(35)(d), (36)(a), (37)(b), (38)(b), (39)(a), (40)(c), (41)(d), (42)(e), (43)(d), (44)(b), (45)(c), (46)(c), (47)(d), (48)(d), (49)(e), (50)(d)

Fill in the blanks:

1. Positive motivation makes people willing to do their work in the best way they can and improve their _____.
2. Physical needs are at the base of the hierarchy theory of motivation while self actualisation needs are at the _____.
3. Under the types of motivators, non-financial motivators are encouragement, freedom _____.
4. One of the merits of _____ is that it recognizes importance of various individual needs and motivation, and yields a contingency model.
5. Costliness of the _____ is the overriding factor determining the extent of decentralization

Ans. 1(performance), 2 (apex), 3 (recognition), 4 (Vroom's theory), 5 (Decision)

II   Short Answer Type Questions:

(a)   Explain the following:

1   Elaborate A.H. Maslow's hierarchy theory of motivation, in detail.
2   What are motivational factors in Herzberg's theory?
3   What do you understand by staffing? Discuss its significance in efficient management.
4   Describe the various steps involved in the process of staffing.
5   Discuss the process of managerial manpower planning in industry.
6   Describe briefly the methods of training and development of managers.
7   Discuss the merits and demerits of internal recruitment.
8   Define training and give its purpose, values and methods.
9   Describe the objectives of performance appraisal.
10   Define direction and give its elements.
11   Explain the importance of effective direction in the process of management.
12   Define motivation and describe critically the two-factor theory of motivation.
13   Discuss the important factors that influence the performance of employees.
14   What are self-actualization needs?
15   According to Herzberg's motivation theory what are the two factors which affect the motivation of people. Discuss.
16   Explain job design.
17   What are the managerial skills required to perform the direction function.
18   Direction is a behavioural science. Explain.
19   What do you mean by Quality of Work Life?
20   What do you understand by manpower planning.
21   Define performance appraisal.
22   Are direction and supervision related.
23   Explain the concept of morale

24   What is meant by training? How is it different from development?
25   What do you understand by matrix organization.

III   Long Answer Type Questions:

1   "In the organizing process, staffing is an important management function." Discuss. Also, give the guidelines for managerial staffing.
2   Staffing has come to be recognized as a separate management function in recent years only." Discuss.
3   "The basic purpose of the selection process is choosing the right type of candidate to man various positions." Discuss.
4   What are the characteristics for selection of persons for junior managerial positions? Discuss and analyze them critically.
5   What is performance appraisal? Discuss briefly the different methods of performance appraisal.
6   What is direction function in management? Discuss different techniques of direction.
7   "A supervisor in order to be effective in his work should have some fundamentals in mind." Discuss.
8   Explain McGregor's Theory X and Theory Y? Which of these theories is more applicable in India? Give reasons.
9   Make a critical study of Maslow's theory of motivation
10   What are the contributions made by the organizations to improve the quality of work life in the organizations?
11   What are the major variables that affect motivation at work place?
12   Compare and contrast Abraham Maslow's motivation theory based on hierarchy of needs and Fredrick Herzberg's motivation hygiene theory. Which of the two theories do you prefer in Indian context and why?
13   Discuss the importance of staffing in an organization. Explain the various steps in the selection process.
14   "Staffing is the responsibility of every manager and not of the personnel department alone." Discuss.
15.   Define training and give its purposes, values and methods.
16.   What do you understand by manpower planning. What is meant by succession planning.
17.   What are the characteristics for selection of persons for junior managerial positions. Discuss and analyse them critically.
18.   What are the sources of recruitment. Explain the various steps taken in the selection procedure.
19   "Motivation is the core of management". Comment. What practical suggestion would you offer to the management to motivate its staff in an industrial organization?
20   Why does staffing become an important managerial function in a big concern ? Indicate the extent to which seniority should be weighed vis-à-vis merit in relation to such matters as transfers and promotions.
21   Design a recruitment and selection programme for recruitment of assistant production manager for a textile unit.

22   State the importance of training for employees. Discuss the different methods of training managerial personnel.
23   Explain the obstacles to effective appraisal. What are the essentials of effective appraisal.
24   What is the meaning, nature and importance of direction as a managerial function.
25   What is supervision. What are the different functions performed by supervisor.
26   What are the qualities of a good supervisor. Explain the supervisor's role in management.
27   Explain the meaning and advantages of job enrichment. In what ways can a job be enriched.
28   What is motivation? Explain Herzberg's two factor theory of motivation.
29   Differentiate between Recruitment and selection.
30   Training and Development are different from each other. Explain.
31   Is pay related to job performance. Explain the different ways adopted by companies for appraising the performance of the employees.
32   Discuss the different approaches to improve motivation level.

UNIT - IV

I   Test Your Skills:

(a)   State Whether the Following Statements are True or False:

1.   Being self-motivated requires a high level of optimism
2.   It is said that 'Delegation is the key to control'.
3.   Leader is the most effective person are alike in one crucial way, they all have a high degree of emotional intelligence.
4.   The technique of control is associated with planning, as a part of scientific management.
5.   The meaning and purpose of control is knowing exactly what work is to be done , knowing that the work has been done or being done , knowing immediately of any delays, hold ups
6.   Communication in industry is a phase both of organisation and moral building
7.   Gita has nothing to do with leadership in management.
8   Decentralization would not be preferred in large-sized units.
9   Management is always defined as dynamic, universal, ever-changing subject.
10   A budget as a plan of statement of expected results is expressed in numerical terms.
11   Financial institutions should maintain a close relationship to seek a seat on the board.
12   Wrong medium of communication is a physical barrier.
13   Delegation and decentralization are closely related to each other.
14   The heart of administration is the directing function.
15   Unity of command means that employees should receive orders from one superior only.

Ans-(1)(T),(2)(F), (3)(T), (4)(T), (5)(T), (6)(T), (7)(F), (8)(F), (9)(T), (10)(T), (11)(F), (12)(F), (13)(T), (14)(T), (15)(T)

(b)   Multiple Choice Questions:

1.   The essence of communication is
(a)   Transmitting Information
(b)   Sharing information
(c)   Importing knowledge
(d)   Sharing understanding

2   Which of the following is not an audial media of communication?
(a)   Public Meeting
(b)   Personal Demonstration
(c)   Interviewing
(d)   Broadcasting

3   One of the most helpful mechanisms for refining a spoken or written communication is called the
(a)   Grapevine
(b)   Counseling service
(c)   Five C.s
(d)   Complaint system

5. What type of control is most important for effective delegation?
        (a) Process
(b) Feedback
(c) Effective
(d) Management

6.What does control maintain, between output and effort?

a) Balance
b) Ends and means
c) Equilibrium
d) Equality

7. One who tries to bring discipline and order through formal structures, plans and processes and tries to monitor performance against plans is a
(a)   Leader
(b)   Manager
(c)   Co-ordinator
(d)   Team-player

8   If the followers are able and unwilling, then the leader will have to use the
(a)   Authoritarian style

(b)   Participative style
(c)   Situational style
(d)   Strategic style

9. Autocratic, Democratic and Laissez-faire leader behavior styles were introduced   by _____.
    (a) University of Iowa researcher
    (b) Michigan Studies
    (c) Ohio State Studies
    (d) None of given option

10.   Leadership can_____ subordinates to help the organization achieve its goals.
    (a) Motivate
    (b) Communicate
    (c) Direct
    (d) All of the above

11.   Leaders who inspire followers to transcend their own self-interests for the good of the organization, and are capable of having a profound and extraordinary effect on followers are_____ leaders.
    (a) Transactional
    (b) Transformational
    (c) Democratic
    (d) Autocratic

12.   Which leadership theory suggests that management style should adapt itself to changing circumstances?
    (a) Contingency theory
    (b) Delegation theory
    (c) Autocratic theory
    (d) Participatory theory

13.   Inspiring and motivating workers to work hard to achieve organizational goals is called _____.
    (a) Planning
    (b) Organizing
    (c) Leading
    (d) Controlling

14.   Which of the following type of leader is likely to have the most profound effect on his or her followers?   Select correct option:
    (a) Educational
    (b) Directive
    (c) Transformational
    (d) Transactional

15. Which of the following is NOT true of charismatic leaders?
    Select correct option:
    (a) They have behavior that is unconventional
    (b) They are willing to take high personal risk
    (c) They have a vision and the ability to articulate the vision
    (d) They show consistency with their followers' behaviors

16. Leaders who guide or motivate their followers in the direction of established goals
    by clarifying role and task requirements are _____ leaders.
    (a) Transactional
    (b) Transformational
    (c) Democratic
    (d) Autocratic

17. Leaders who motivate their employees through rewards are
    (a)   Positive leaders
    (b)   Negative leaders

18. Participative leaders
    (a)   Centralise decision making authority
    (b)   Decentralise decision making authority

19. Leaders are identified on the basis of their traits in
    (a)   Trait theories
    (b)   Behavioural theories
    (c)   Situational theories

20. Leaders who create a shared vision with their followers are:
    (a)   Transactional leaders
    (b)   Transformational leaders

1. _____ is a communication that flows from a higher level to one or more lower
   levels in the organization.
       (a) Horizontal communication
       (b) Upward communication
       (c) Downward communication
       (d) None of given option

2. The process by which a sender transmits content is known as
       (a) Encoding
       (b) Decoding
       (c) Feedback
       (d) Receiver

3. When a subordinate or lower level manager passes information or offers suggestions to
   higher level management, they're using which level of communication?

(a) Upward communication
    (b) Downward communication
    (c) Lateral communication
    (d) Diagonal communication

4. Communication network where all members interact freely is
    (a) Star network
    (b) Chain network
    (c) Wheel network

5. Oral, written and symbolic communication are the media of
    (a) Formal communication
    (b) Informal communication
    (c) Both

6. When information flows amongst people working at the same level, it is known as
    (a) Vertical communication
    (b) Horizontal communication
    (c) Diagonal Communication

7. Communication involves transfer of
    (a) Information
    (b) Understanding
    (c) Both

8. A budget is what type of control?
    (a) Standard
    (b) Process
    (c) Division
    (d) Financial

9. A/An_____ is a formal evaluation of an organization's financial statements, performed either by an outside accounting firm or by an internal department.
    (a) Revenue operating budget
    (b) Incident log
    (c) Financial audit
    (d) Balance sheet budget

10. In a PERT network, slack time is_____.
    (a) The end point that represents the completion of a major activity
    (b) The time or resources required to progress from one event to another
    (c) The amount of time an individual activity can be delayed without delaying the whole Project
    (d) The longest or most time-consuming sequence of events and activities

11. _____ involves allocating resources by detailing what activities have to be done, the order in which they are to be completed, who is to do each, and when they are to be completed.
    (a) Benchmarking
    (b) Budgeting
    (c) Scheduling
    (d) Competitor intelligence

12. Monitoring progress towards goal achievement and taking corrective action when needed is called
    (a) Controlling.
    (b) Planning
    (c) Forecasting
    (d) Directing

13. The exception principles to control means
    (a)   Control over significant deviations
    (b)   Control over all deviations
    (c)   Control over no deviations

14. Control over the activities while they are in process is:
    (a)   Feed forward Control
    (b)   Concurrent control
    (c)   Feedback Control

15. Controls exercised by lower level managers are:
    (a)   Strategic level controls
    (b)   Tactical level controls
    (c)   Operating level controls

16. Principle of preventive control means:
    (a)   Avoid the occurrence of deviations
    (b)   Correct the deviations
    (c)   None of these

17. Management audit is a technique that controls company's
    (a)   Financial statements
    (b)   Internal management
    (c)   Both (a) and (b)

18. Kurt Lewin coined the term "Planned change" to mean:
    (a)   Changes which were thought out and planned in advance
    (b)   Changes which were planned and implemented by outside consultants
    (c)   Changes which were intentional and not accidental
    (d)   Changes which were planned and implemented by senior managers

39   Which of these is not a principle of great man theory?
        a) Leaders are born not made.
        b) Great men rise up in times of crisis.
        c) We can learn from the biographies of great
        d) All of the above

40   In leadership trait theory what is a trait?
        a) A list of the things that make leaders different to everyone else.
        b) A list of the key things that a leader should do to be great.
        c) The list of key behaviours a leader exhibits.
        d) A list of key characteristics that makes a leader great.

41. Managers making ethical decisions may belong to any of the three levels of moral development. Which of the following stages describes the conventional level of moral development?
    (a)   Following rules only when it is in one's immediate interest
    (b)   Valuing rights of others and upholding absolute values and rights, regardless of the majority's opinion
    (c)   Sticking to rules to avoid physical punishment
    (d)   Living up to what is expected by people who are close to oneself
    (e)   Following self-chosen ethical principles even if they violate the law.

42. Direct control is the control that is exercised after the deviations from plans have occurred. Which of the following is not an underlying assumption of direct control?
    (a)   Performance can be measured
    (b)   Personal responsibility is absent
    (c)   The time expenditure is warranted
    (d)   Mistakes can be discovered in time
    (e)   The individual who is responsible will take corrective steps.

43. Which function of management involves filling, and keeping filled, the positions in the organization structure?
    (a) Organizing
    (b) Planning
    (c) Staffing
    (d) Controlling
    (e) Leading.

44. Which of the following is not true about 'power'?
    (a) Power requires no formal position
    (b) Power works both ways – downward and upward
    (c) Power is derived from many sources
    (d) Formal authority is a type of power
    (e) Power is a narrow term compared to authority.

45. In an organization, a superior has the right to get tasks accomplished by his subordinates, but the responsibility remains with the superior. This principle which intends to eliminate the practice of "passing the buck", is known as
 (a) Authority on par with responsibility
 (b) Hierarchy of authority
 (c) Unity of direction
 (d) Downward delegation of authority
 (e) Unity of command.

46. Robert Owen was one of the prominent contributors to preclassical management thought. Which of the following did Robert Owen advocate/propose?
 (a) Division of labor
 (b) Legislative reforms to improve working conditions of labor
 (c) Profit-sharing plan
 (d) Study of management
 (e) Emphasis on the importance of business skills for running a business.

47. Informal communication is also referred to as
 (a) Grapevine
 (b) Buzz
 (c) Pipeline
 (d) Noise
 (e) Uproar.

48. An intervention, in Organization Development (OD) terms, is a systematic attempt to correct an organizational deficiency uncovered through diagnosis. Which of the following intervention techniques is concerned with the interpersonal relations and dynamics operating in work groups?
 (a) Technostructural activity
 (b) Team building
 (c) Skill development
 (d) Process consultation
 (e) Survey feedback.

49. Why do such companies as Ford, Federal Express, Boeing, or Proctor & Gamble put together cross-functional teams?
 (a) Because each member has unique knowledge that adds value to the overall decision
 (b) Because it is cheaper than hiring consultants
 (c) Because decisions can be reached at almost twice the speed of other decision format styles
 (d) Because it diffuses risk (blame) of a wrong decision choice
 (e) Because of inadequate availability of manpower.

50. Which of the following is an advantage of the functional structure?
 (a) It follows principle of occupational specialization
 (b) It permits growth and diversity of products and services

(c) There is better face-to-face communication with local interests
(d) There is improved environmental monitoring
(e) It improves coordination in a region.

ANS-(1)(d),(2)(b),(3)(c),(4)(b),(5)(c),(6)(a),(7)(a),(8)(a), (9)(a), (10)(d), (11)(b), (12)(a), (13)(c), (14)(b), (15)(d), (16)(a), (17)(a), (18)(b), (19)(a), (20)(b), (21)(d), (22)(a), (23)(a), (24)(a), (25)(c), (26)(b), (27)(c), (28)(d), (29)(c), (30)(c), (31)(b), (32)(a), (33)(a), (34)(b), (35)(c), (36)(a), (37)(b), (38)(c), (39)(d), (40)(d), (41)(d), (42)(b), (43)(c), (44)(e), (45)(d), (46)(b), (47)(a), (48)(d), (49)(a), (50)(a)

Fill in the Blanks:

1. _____ is the most effective person are alike in one crucial way, they all have a high degree of emotional intelligence.
2. Managerial function of control is the _____ and correction of performance of various activities.
3. Profiting both qualitatively and quantitatively the competencies of the organization is called _____ planning.
4. According to situational leadership approach, the style that denotes a high-task and a low-relationship style is _____.

Ans 1 (Leader), 2 (measurement), 3 (Capability), 4 (Telling style)

II   Short Answer Type Questions:

1   Define leadership. Explain the styles of leadership.
2   What are the objectives of control?
3   Explain 'Feedback Control'
4   What is feed forward control?
5   Explain modern techniques of control.
6   "Written communication should always be preferred in an official setup". Elucidate.
7   Explain various types of Managerial Communication.
8   Difference between formal and informal communication
9   What do you understand by organizational change? What factors cause organizational changes?
10   Explain various types of changes which can be introduced by an organization.
11   Discuss the importance of Change in an organization.
12   Differentiate between Autocratic and Free- rein leadership styles.
13   Explain the free-rein style of leadership.
14   What are the barriers to communication?
15   Discuss the steps in the control process.
16   What is the contingency theory of leadership?
17   Discuss importance of informal communication in the organization.
18   What do you mean by concurrent control?
19   What are the functions of leaders?
20   What is the importance of communication?

21   Explain the communication process.
22   Explain David Mcclelland's Three need theory

III   Long Answer Type Questions:

1.   How might the manager of a restaurant use concurrent controls to ensure that the restaurants providing customers with the highest quality food and service? What feedback control should be useful? Justify your answers.

2.   Describe the elements of the communication process. Give an example of each part of the model as it exists in the classroom during communication between teacher and students

3.   What are the barriers to communication and how can we overcome them.

4.   "Communication is sharing of understanding". Discuss the merits and demerits of oral and written communication.

5.   "The existence of variety of communication media does not itself guarantee the success of communication". Comment.

6.   "Change is the process of an organization" are inevitable in the light of innovation adoption." Discuss in detail.

7.   What do you understand by change in product design/product modification? Why does the necessity for changing product design arise?

8.   "Building culture for change is a time – consuming exercise and involves lot of efforts". Explain.

9.   "Before initiating the change process, it is very important to diagnose/assess the organizational capability to change". Is it true? Discuss.

10.   Bring out the distinction between Maslow and Herzberg theories of motivation. What is the role of money in motivating the managers?

11.   "A good leader is one who understands his subordinates, their need and their sources of satisfaction". Comment on this statement and highlight the traits of effective leaders.

12.   (a) Briefly identify the major styles from Blake and Mouton's Managerial Grid.

13.   (b) Mention some of the needed skills for leaders / managers to be effective.

14.   Briefly explain techniques that management may use to overcome resistance to change.

15.   Explain:

(a)   Force field analysis
(b)   Lewin's model of change
(c)   Stages of organizational growth

16.   Explain the importance of control in a business org. discuss the process of   control with suitable illustration.

17.   Why is control a must in business mgt? What are the requirements of an effective control system?

18.   Why do employees inherently dislike and resist control. Suggest measures to overcome resistance to control.

19. "Planning is meaningless without control and control is aimless without planning". Explain the statement with examples.
20. How will you check the effectiveness of the communication system prevailing in your organization.
21. Discuss the major advantages and disadvantages of Management by Exception.
22. Briefly explain operational research techniques for taking managerial decisions
23. Explain Graicuna's theory of Span of Control with suitable example.
24. Explain in detail various forces of change.
25. "Different leadership styles exist among leaders in different times and in different situations." Discuss and give the important leadership styles.
26. Critically examine the statement "If you want to control everything, you may end up controlling nothing."
27. "Organisational change has to be managed on technological, social and economic dimensions." Elaborate. What precautions must be taken in a democratic set up to make a change acceptable to the personnel?
28. "Despite the development of high speed electronic devices, communications are not successful in many cases." Discuss.
29. "If communicate has not understood, the communicator has not communicated." In the light of this statement, give suggestions for making communication effective.
30. Communication and coordination are two faces of the same coin. Explain with suitable examples.
31. "Leadership is the driving force which gets things done." Explain.
32. Compare and contrast system 1 and system 4 of leadership.
33. "Organizational controls interfere with the freedom organizational members." Comment.
34. What is statistical Quality control? Discuss its techniques and advantages.
35. "Educated employees do not like autocratic leadership, but it is necessary with uneducated employees." Discuss.
36. "Communication is merely a sum of saying and listening processes." Is this definition complete? Discuss.
37. "Controlling as a function of management means the measurement and correction of performance of activities of subordinates." Discuss and give the requirements of an effective control system.
38. Explain the various behavioural theories of leadership. Elaborate on the trait theory of leadership.
39. How does maturity level of employees affect leader behavior according to Hersey and Blanchard's situational leadership theory.
40. What is communication? What are the common barriers to effective communication in an organisation?

41. Describe the various communication networks which facilitate flow of communication in an organization.
42. Identify important leadership styles and indicate the conditions in which a particular style is appropriate to be used.
43. What do you mean by managerial control? Identify few aids used in management controlling.
44. What is the need of change in an organization? Explain trends in organizational change.
45. Explain the communication process and the various communication channels in detail.
46. Explain the concept of controlling and the different types of control.