

Deepshikha

2014

Time : 3 hours

Full Marks : 80

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

Answer any five questions.

1. Prove the following :

(a) $\overline{A \cup B} = \bar{A} \cap \bar{B}$

(b) $\overline{A \cap B} = \bar{A} \cup \bar{B}$

2. Express the following sets in tabular form :

(a) Set of all positive integers less than 49 and divisible by 7

(b) $\{x | x \in \mathbb{N}, 3 < x < 10\}$

3. (a) Define equivalence relation on a set with an example.

(b) Show that inverse of an equivalence relation is an equivalence relation.

4. (a) Define injective and surjective functions with examples.

(b) Let $g : \mathbb{R} \rightarrow \mathbb{R}$ be defined by

$$g(x) = \begin{cases} x^2 - 4x & \text{if } x \geq 3 \\ x + 3 & \text{if } x < 3 \end{cases}$$

Find $g(5)$ and $g(-3)$.

5. (a) Define vector space with an example.

(b) Define and illustrate with examples :

(i) Ring with unity

(ii) Field

6. (a) Prove that identity element and inverse of an element in a group are unique.

(b) Prove $(ab)^{-1} = b^{-1}a^{-1}$,

where a and b are any two elements of a group.

7. (a) Let L be a bounded distributive lattice. Then prove, if a complement exists, is unique.

(b) Determine all maximal and minimal elements of the poset :

$$S = \{2, 3, 4, 6, 8, 24, 48\}$$

with the partial order of divisibility.

8. (a) Find the values of the Boolean function represented by $f(x, y, z) = (x \wedge y) \vee z$

(b) Write down the axioms of Boolean algebra.

9. Let $A = \{1, 2, 3, 4, 6, 8, 12\}$ and R be the partial ordering on A defined by aRb if a divides b .

Then :

(a) Draw the Hasse diagram of the poset (A, R)

(b) Determine the relation matrix for R .

(c) Construct the directed graph on A that is associated with R .

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10. Write short notes on any four of the following :

(a) Power set ✓

(b) Integral domain

(c) Function ✓

(d) Use of K-maps ✓

(e) Poset ✓

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1. (a) Draw the logic symbol and construct the truth table for each of the following gates : 8

- (i) Two input NAND gate
- (ii) Three input OR gate
- (iii) Three input EX-NOR gate
- (iv) NOT gate

(b) Design a counter with the following binary sequence :

0, 1, 3, 7, 6, 4 and repeat. (Use T flip-flop). 8

(Turn over)

2. (a) Draw the schematic diagram of a master-slave J-K flip-flop. Discuss its working principle. What are its advantages over other types of flip-flops ? 8

(b) An 8 bit register contains the binary value 10011100. What is the register value after an arithmetic shift right ? Starting from the initial number 10011100, determine the register value after an arithmetic shift left, and state whether there is an overflow. 8

3. (a) How does one detect and correct errors during data transmission ? 8

(b) Explain the IEEE standard for floating point number with suitable examples. 8

4. (a) Evaluate the arithmetic expression $X = (A + B) * (C + D)$ using one, two and three address instruction. 8

(b) Compare RISC and CISC instructions. Give their respective advantages and disadvantages. 8

5. Define addressing modes and explain the basic addressing modes with an example for each. 16
6. Derive an algorithm in flow chart form for the Restoring method division. Explain with example. 16
7. How does the Booth multiplication algorithm work? Give out its flow chart for signed two's complement multiplication of numbers and explain with a numerical example. 16
8. Draw the flow chart for addition and subtraction operation of floating point numbers. 16
9. (a) Draw the block diagram of Memory Hierarchy. 6
- (b) What do you mean by virtual memory? Discuss how paging helps in implementing virtual memory. 10
10. What is meant by cache mapping? List out the mapping techniques and discuss their operation. 16



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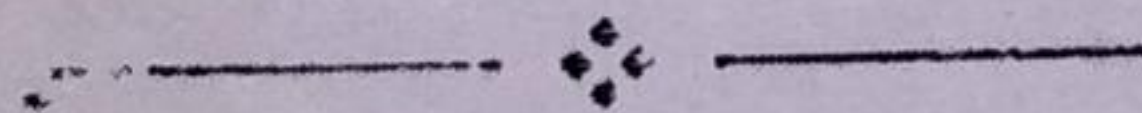
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Answer any five questions.

1. (a) Explain C tokens in details
- (b) Compare between if-else and switch statements.
2. (a) What is array ?
- (b) Write a program in C to create a 4×4 matrix and hence display the transpose of it.
3. (a) Write a program in C to obtain the factorial of a user defined positive number using recursion.

(Turn over)

- (h) How can we pass array to a function ?
4. (a) Compare between array and structure.
- (b) Write a program in C using pointer to display the maximum between two user defined numbers.
5. Write a program in C to add a node at any position of a linear linked list.
6. Write a program in C to add an item to a stack.
7. Write a program in C to delete an item from a liner queue.
8. Explain binary tree in details.
9. (a) Describe binary search technique.
- (b) Explain bubble sort technique with example.




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1. Discuss the roles of MIS. How it offers support to organization. 16
2. (a) Explain different types of information system. 8
(b) What is meant by system analysis ? Discuss its main functions. 8
3. Explain, in detail, the activities performed in each phase of System Development Life Cycle. 16
4. What is cost/benefit analysis ? Explain the various evaluation methods for cost/benefit analysis. 16

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5. What do you mean by fact finding? What are the main advantages of questionnaire technique for fact finding? Explain. 16
6. What are Data Flow Diagrams? What are the different types of DFDs used in system development process? Explain the rules for drawing good DFDs. 16
7. (a) Describe 'Software Maintenance'. 6
(b) Explain briefly the different levels of quality assurance. 10
8. (a) Discuss, in detail, the top down approach for system planning and its implications for system development. 10
(b) What is audit trail? Why is it necessary? 6
9. (a) Describe, in detail, unit testing. 8
(b) List and explain different methods for system evaluation and performance. 8
10. (a) Explain, in detail, Hardware acquisitions. 8
(b) Describe the factors to be considered in the selection of software. 8

