

2021*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. (a) Define Union, intersection, sum, difference of two sets. Disjoint sets, complement of a set, Null set and power set.
(b) If $A = \{1, 2, 3, 4\}$, $B = \{2, 3, 4, 5\}$ and $C = \{3, 4, 5, 6\}$. Find :
 - (i) $A \cup (B \cap C)$
 - (ii) $(A \cap B) \cup C$
 - (iii) $A - B$
 - (iv) $A - (B - C)$
2. (a) Define ordered pair and Cartesian product of two sets.

(b) If $A = \{1, 2\}$, $B = \{2, 3\}$ and $C = \{3, 5\}$ then Find :

(i) $A \times (B \cup C)$

(ii) $A \times (B \cap C)$

(iii) $(A \times B) \cap (A \times C)$

(iv) $(A \times B) \cup (A \times C)$

3. (a) What is Venn diagram ? Represent Union, intersection, subset of set and complement of a set by Venn diagram.

(b) In a group of 70 persons, 37 like coffee, 52 like tea and each person like at least one of the two drinks. Calculate :

(i) How many people like coffee not tea.

(ii) How many like coffee but not tea.

4. (a) Define equivalence relation on a set. Give an example.

(b) If R be a relation in the set of integers Z defined by $R = \{(x, y) : x \in Z, y \in Z, (x - y) \text{ is divisible by } 6\}$ then prove that R is an equivalence relation.

5. (a) Discuss various types of functions with examples.

(b) Show that the function $f(x) = x^3$ and $g(x) = x^{\frac{1}{3}}$ for all $x \in \mathbb{R}$ are inverse of one another.

6. (a) Does there exist a 4 regular graph on 6 vertices? If so, Construct a graph.

(b) Show that the maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$.

7. Define abelian group and show that the set of integers \mathbb{Z} forms an abelian group with respect to addition and multiplication.

8. (a) Define Ring and Field.

(b) For the set $I_4 = \{0, 1, 2, 3\}$ show that modulo 4 system is a field.

9. (a) Define partially ordered set and show that the relation \geq is a partial ordering on the set of integers \mathbb{Z} .

(b) Draw the Hasse diagram for the poset $(P(s), \subseteq)$, where $P(s)$ is the power set on $s = \{a, b, c\}$.

10. (a) Define Lattice with examples.

(b) Consider the set $A = \{1, 2, 3, 4, 6, 8, 9, 12, 18, 24\}$ be ordered by relation 'x divides y'. Find the Hasse diagram.



Handwritten notes in blue ink:
 $A = \{1, 2, 3\}$
 $A \times A = \{1, 2, 3, 4, 6, 9\}$
 ✓

2021

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. Convert decimal to binary :
 - (a) 91
 - (b) 55
 - (c) 286
 - (d) 35.2
2. Explain 1's and 2's complement with the help of suitable example. Also, discuss the uses of 2's complement.
3. (a) What are Universal Gates ? Explain it in detail.
(b) Explain various types of flip-flop and its uses.

4. Describe the memory organization in detail.

5. What is virtual memory ? Discuss its benefits. ✓

6. Describe the working of Full-adder and design it by using two half adders.

7. Describe standard I/o interface in detail.

8. Find 2's complement of the following :

(a) 10110111

(b) 101111001

(c) 11000111

(d) 1010101100

9. Describe the modes of data transfer and discuss Asynchronous data transfer.

10. Write short notes on any **two** of the following :

(a) Multiplexer

(b) DMA

(c) De Morgan's Theorem

(d) Counter



2021

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. Define Data-structure. Discuss various types of Data-structure with an example.
2. What is Recursion ? Explain recursive functions with the help of an example.
3. What is an Array ? Explain various types of Array used in data-structure.
- ✓ 4. Explain Linked-List Data-structure. Write the advantages of linked-list over an array.
5. Write a program to add two $[2 \times 2]$ Matrix using C.

6. Describe Queue. Explain the implementation of Queue using Array and Linked-List.
7. What is a Tree ? Describe Binary Tree with an example.
8. Explain prefix, infix and postfix traversal of tree with an example.
9. Describe different types of sorting techniques.
10. Write short notes on any **two** of the following :
- (a) Loop
 - (b) Pointer
 - (c) Graph
 - (d) Stack



2021

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. What is System Analysis ? Explain the importance of System Analysis and Design.
2. What do you mean by System ? Describe various types of system and their characteristics.
3. Explain Waterfall Model and also discuss its advantages and disadvantages.
4. What is feasibility study ? Explain various types of feasibility.
5. Describe System Requirements Specification (SRS) in detail. Define Data Dictionary.

- ✓ 6. Define Data-Flow-Diagram (DFD). Explain decision Tree and Decision Table.
- ✓ 7. Describe Testing and Testing Objectives. Explain various types of testing.
- ✓ 8. What are the different components of MIS ? Discuss failure and success of MIS.
- ✓ 9. Describe the role and attributes of System Analyst.
- ✓ 10. Write short notes on any **two** of the following :
 - ✓ (a) SDLC
 - (b) HIPO
 - ✓ (c) Black box and White box Testing
 - (d) Maintenance and types of maintenance

