

CSE
(Discrete Structure)
Paper : CS-205

Time : 3 Hours]

[Maximum Marks : 60

Note :- Attempt all *six* questions. All questions carry equal marks. Symbols have their usual meanings.

1. Write short notes on the following :
- Explain Power set and Proper subset.
 - What is Equivalence Relation ?
 - Explain Group and Semigroup.
 - Explain Finite and Infinite Sets.
 - Explain Path, Walk and Circuit.

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Turn Over

2. If $f : \mathbb{R} \rightarrow \mathbb{R}$, defined by $f(x) = x^2 \forall x \in \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$, defined by $g(x) = \sin x \forall x \in \mathbb{R}$. Then find $g \circ f$ and $f \circ g$ also show that $(g \circ f) x \neq (f \circ g)x$.

Or

Show that :

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$$

3. Is the following formula a tautology ?

$$(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$$

Or

Is the following formula a tautology ?

$$p \rightarrow [p \wedge (q \rightarrow p)]$$

4. What are distributive and complemented lattices ?

Explain with example.

Or

Explain partial ordering set with example. Also explain morphism.

5. Explain any *two* of the following :

- Cyclic monoid
- Ciroupoid
- Integral domain

Or

Define Ring. If a, b and c are arbitrary elements of ring R then prove that :

$$a.0 = 0.a = 0$$

6. Explain Eulerian and Hamiltonian walk.

Or

Explain graph colouring. What is chromatic numbers ?

Or

Explain partial ordering set with example. Also

- Note : i) Attempt all six questions.
 ii) All questions carry equal marks.
 iii) Symbols have their usual meanings.

- Q.1. Write short notes on the following : 10
 a) Deduction theorem
 b) Power sets
 c) Pseudo-Boolean lattices

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- d) Morphisms
 e) Pigeon-hole principle

Unit - I

- Q.2. Prove that $f^{-1}(A \cup B) = \{f^{-1}(A)\} \cup \{f^{-1}(B)\}$. 10

OR

If $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then find out the relation from A to B, defined by "is less than". Find out the domain and range of the relation.

Unit - II

- Q.3. Show that the following is invalid. "If I buy stocks, I will lose money. Therefore, If I lose money, I buy stocks". 10

OR

Differentiate with examples :

- a) Finite and Infinite sets
 b) Countable and Uncountables

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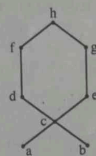
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Unit - III

- Q.4. Consider the po-set $A = \{a, b, c, d, e, f, g, h\}$ represented by the following Hasse diagram. Determine all lower and upper bounds of the subsets. 10



OR

What do you mean by complete Lattice and Monotonic function? State and prove Knaster-Tarski's fixed points theorem.

Unit - IV

- Q.5. What is the difference between a ring and a field? If R is a ring such that $a^2 = a, \forall a \in R$ 10
 Prove that:

- i) $a + a = 0, \forall a \in R$
 ii) $a + b = 0, \Rightarrow a = b$

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OR

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OR

Explain free and cyclic monoids.

Unit - V

Q.6. Draw a graph with the given adjacency matrix. 10

a)
$$\begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 4 \\ 2 & 4 & 0 \end{bmatrix}$$

b)
$$\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

Also define degree, path, cycle.

OR

Explain with suitable examples :

- i) Isomorphism
- ii) Planar graph



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