

Seat No.	
----------	--

S.Y. B.Tech. (Computer Science and Engineering) (Part - II)
(Semester - III) (CBCS) Examination, January - 2023
DISCRETE MATHEMATICAL STRUCTURES
Sub. Code: 73277

Day and Date : Monday, 23 - 01 - 2023

Total Marks : 70

Time : 10.30 a.m. to 1.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.

Q1) Solve MCQs. (2 Marks Each).

- a) Infix to Prefix of the given expression $P \rightarrow Q \wedge R \vee S$ is _____.
 - i) $\rightarrow P \vee \wedge Q R S$
 - ii) $\rightarrow P \vee Q R \wedge S$
 - iii) $\rightarrow P \vee Q \wedge R S$
 - iv) $\rightarrow P \vee Q \wedge R S$
- b) $P \rightarrow (Q \rightarrow R)$ is equivalent to.
 - i) $(P \wedge Q) \rightarrow R$
 - ii) $(P \wedge Q) \rightarrow Q$
 - iii) R
 - iv) Tautology
- c) Let $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and relation x divides y be a partial ordering on D_{30} . The LUB of 10 and 15 is.
 - i) 10
 - ii) 15
 - iii) 30
 - iv) 6
- d) Let A and B be two sets such that $A = \{1, 3, 5, 7, 11\}$, $B = \{2, 6, 8, 5, 11\}$ then the set $A-B$ is equal to.
 - i) $\{1, 2, 3, 5, 6, 7, 8, 11\}$
 - ii) $\{1, 3, 5, 7, 11\}$
 - iii) $\{2, 6, 8\}$
 - iv) $\{1, 3, 7\}$
- e) Partial ordered relation is transitive, reflexive and _____.
 - i) Antisymmetric
 - ii) Bisymmetric
 - iii) Anti reflexive
 - iv) Asymmetric

P.T.O.

- f) Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ Let R be a relation defined on X given as $R = \{ \langle x, y \rangle \mid x + y = 10 \}$. Then R is.
- i) Reflexive, Symmetric and Transitive
 - ii) Irreflexive Antisymmetric and Transitive
 - iii) Only Symmetric
 - iv) Only Antisymmetric
- g) Let n be a positive integer and D_n be set of all positive divisors of n . Then D_n is a lattice under the relation of divisibility. Then what are the elements of D_{20} ?
- i) $D_{20} = \{1, 2, 4, 5, 10, 20\}$ ii) $D_{20} = \{1, 2, 4, 10, 20\}$
 - iii) $D_{20} = \{1, 2, 4, 10, 20\}$ iv) $D_{20} = \{1, 2, 4, 5, 6, 10, 20\}$

Q2) Solve any 2 of the following. (7 Marks Each).

- a) Show the following without constructing truth table: [7]
- i) $((P \vee \neg P) \rightarrow Q) \rightarrow ((P \vee \neg P) \rightarrow R) \Rightarrow (Q \rightarrow R)$
 - ii) $\neg (P \leftrightarrow Q) \Leftrightarrow (P \vee Q) \wedge \neg (P \wedge Q)$
- b) Consider the set $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{ \langle x, y \rangle \mid x - y \text{ is divisible by } 5 \}$. [7]
- i) Write the relation set R
 - ii) Identify which properties are satisfied by R
 - iii) Is R an Equivalence relation
 - iv) Write the matrix of R and sketch its graph
- c) Define Lattice and Totally ordered set. Give one example of totally ordered set. Let $S = \{a, b, c\}$. Draw the diagram of $\langle \rho(S), \subseteq \rangle$. Is it a lattice? [7]

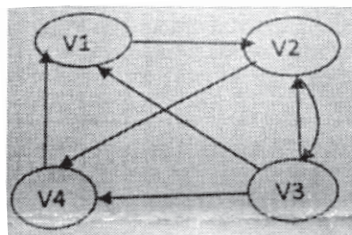
Q3) Solve any 2 of the following. (7 Marks Each).

[7]

- a) Define and give one example of each.
 - i) Graph
 - ii) Geodesic path
 - iii) Mixed graph
 - iv) Weighted graph
 - v) Unilaterally connected graph
 - vi) Null graph
 - vii) Complement of a Graph
- b) Define Monoid Homomorphism. Give an example. [7]
- c) Define Semigroup, Monoid and path Group. Give an example of each. [7]

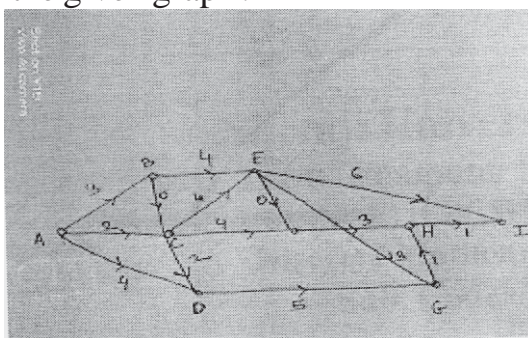
Q4) Solve any 2 of the following. (7 Marks Each).

- a) Define adjacency matrix and path matrix, Find adjacency matrix and path matrix for the given graph. [7]



Write one Simple path and one Elementary path from v1 to v3.

- b) Write a note on PERT. Compute the earliest completion time & latest completion time for the given graph. Identify and write the critical path in the given graph? [7]



- c) Define the following terms and give one example of each. [7]
 - i) Bounded lattice
 - ii) Complete lattice
 - iii) Complemented lattice
 - iv) Distributive lattice

Q5) Solve any 2 of the following. (7 Mark Each).

- a) Given $S = \{a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8\}$ what subsets are represented by B_{17} , and B_{31} ? Also write how will you designate the subsets $\{a_2, a_6, a_7\}$ and $\{a_1, a_8\}$. [7]
- b) Describe the terms. [7]
- i) Proper inclusion
 - ii) Relative complement
 - iii) Absolute complement
 - iv) Symmetric difference
- $A = \{1, 2, 3, 4, 5\}$ $B = \{a, b, 5, 6\}$
 Is A proper subset of B?
 Find $A-B$ and $B-A$
 Find $A+B$
- c) For the function $f(x, y, z) = x + \tilde{y} + z$ give. [7]
- i) Truth table representation.
 - ii) K-map representation
 - iii) Cube representation
 - iv) n-space representation

