## M.Sc.-II (Mathematics) (CBCS Pattern) Fourth Semester CBCS **PSCMTHT20.2-Paper-V : Elementary Discrete Mathematics (Optional)**

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	Note	es: 1. Solve all the <b>five</b> questions. 2. Each question carry equal marks <b>20.</b>	
		UNIT – I	
1.	a)	Construct the truth table for $\neg (P \land Q) \rightleftharpoons (\neg P \lor \neg Q)$ .	10
	b)	Define universally valid formula & substitution instance formula. Show the $P \rightarrow (Q \rightarrow R) \Leftrightarrow P \rightarrow (\neg Q \lor R) \Leftrightarrow (P \land Q) \rightarrow R$	at 10
	c)	Obtain the conjunctive normal forms of: i) $P \land (P \rightarrow Q)$ ii) $\neg (P \lor Q) \rightleftharpoons (P \land Q)$	10
	d)	Obtain the principal disjunctive normal forms of: i) $\neg P \lor Q$ ii) $(P \land Q) \lor (\neg P \land R) \lor (Q \land R)$	10 2)
		UNIT – II	
2.	a)	State & prove the isotonicity property of the lattice.	10
	b)	Find all the sublattices of the lattice $(S_n, D)$ for $n = 12$	10
	c)	OR State & prove the distributive inequalities of lattice.	10
	d)	If $a \le b \& c \le d$ then show that $a * c \le b * d$ ?	10
		UNIT – III	
3.	a)	What is Boolean Algebra? Simplify the Boolean expressions: i) $(a*b)' \oplus (a \oplus b)'$ ii) $(a*c) \oplus c \oplus [(b \oplus b')*c]$ iii) $(a'*b'*c) \oplus (a*b'*c) \oplus (a*b'*c')$	10
	b)	Obtain the sum of product canonical form of $x_1 \oplus (x_2 * x_3')$ & product of	sum canonical 10
		form of $x_1 * x_2$ .	
	c)	In any Boolean algebra show that: i) $a = b \Leftrightarrow ab' + a'b = 0$	10

- ii)  $a = 0 \Leftrightarrow ab' + a'b = b$
- iii) (a+b) (a'+c) = ac + a'b = ac + a'b + bc
- iv)  $a \le b \Longrightarrow a + bc = b(a + c)$

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d) State the circuit diagram representation of following functions:

- i)  $f_1 = x + y + z$
- ii)  $f_2 = \overline{x} \overline{y}z + \overline{x}y\overline{z} + xy\overline{z}$
- iii)  $f_3 = \overline{w} + y (\overline{x} + \overline{y})$

## $\mathbf{UNIT} - \mathbf{IV}$

- 4. a) Define:
  i) Isomorphism of graphs.
  b) Show that a graph with n nodes can have at most n(n-1) edges.
  - b) Define reachability. Show that in a simple diagraph the length of any elementary path is **10** less than or equal to (n-1).

## OR

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c) Find all the indegrees & outdegrees of the diagraph:  $v_1 \circ v_4$ 

 $V_2$ 



d) Find A,  $A^T$ ,  $AA^T & A^T A$  also  $A \wedge A^T$  for the diagraph:



Solve all the four questions :

- a) Construct the truth table for  $(P \rightarrow Q) \land (Q \rightarrow P)$ .
- b) Define the Hasse diagram & draw the Hasse diagram for the lattices  $(S_6, D), (S_8, D) & (S_{30}, D)$ .
- c) Define sub-algebra & Boolean homomorphism.
- d) How the two diagrams with different shapes may represent the same graph show by example. 5

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