SUMMER-2014

UNIT 1

Q1. a) Obtain PDNF of $\neg(P \vee Q) \leftrightarrows (P \wedge Q)$. **(5)**

b) Explain with example: i. Tautology ii. Contradiction iii. Equivalent formulas **(8)**

Q2. a) Obtain PDNF of $(\neg P \rightarrow R) \wedge (Q \leftrightarrows P)$. **(5)**

b) Show the following implications without using truth tables:

i) $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$

ii) $(P \vee Q) \rightarrow C \Leftrightarrow (P \rightarrow C) \wedge (Q \rightarrow C)$ **(8)**

UNIT 2

Q3. a) Show that,

$(x)\,(P(x) \rightarrow Q(x)) \wedge (x)\,(Q(x) \rightarrow R(x)) \Rightarrow (x)\,(P(x) \rightarrow R(x))$ **(7)**

b) Explain the following with example: i. Universal Quantifier ii. Existential Quantifier iii. Free and bound variables. **(6)**

Q4. a) Show that, $(G \vee H)$ is a valid conclusion for $(B \wedge C)$, $(B \Leftrightarrow C) \rightarrow (H \vee G)$. **(7)**

b) Demonstrate that R is a valid inference from the premises $P \rightarrow Q$, $Q \rightarrow R$ and P. **(6)**

UNIT 3

Q5. a) Prove that,

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ by using Venn diagram and formal proof. **(6)**

b) Let the compatibility relation on a set $\{x_1, x_2, \ldots, x_6\}$ is given by the matrix

x_2	1				
x_3	1	1			
x_4	0	0	1		
x_5	0	0	1	1	
x_6	1	0	1	0	1
	x_1	x_2	x_3	x_4	x_5

Draw the graph and find the maximal compatibility blocks of the relation. **(7)**

Q6. a) Given the relation matrices M_R and M_S find $M_{R \circ S}$, M_R, M_g, $M_{R \circ \bar{S}}$ Show that $M_{R \circ \bar{S}} = M_{\bar{S} \circ \bar{R}}$ **(7)**

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \quad M_S = \begin{bmatrix} 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$$

b) Define the terms with example:

i. Equal set ii. Power set

iii. Relative complement iv.Absolute complement.

(6)

UNIT 4

Q7. a) For function x'y'z' + x'yz' + xy'z give:

i.Circuit Diagram representation. ii.Truth Table representation. iii. K-map representation. **(7)**

b) Find out left coset of H in $(Z_4, +_4)$, where H = {[0], [2]} **(6)**

Q8. a) Consider an arithmetic expression (A + B)*(C – D). Convert it into postfix form and prefix form. **(7)**

b) Define the terms:

i. Group ii. Semi Group

iii. Monoid iv. Ring. **(6)**

UNIT 5

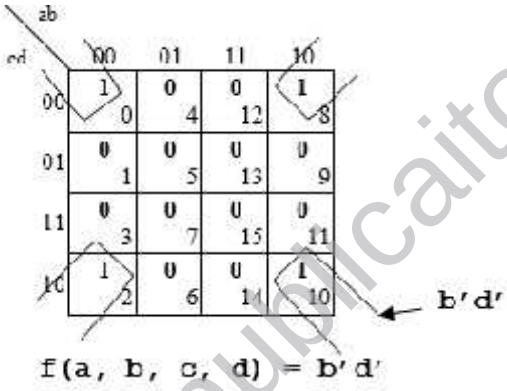
Q9. a) Obtain the sum of product canonical form for the following Boolean expression: $(x_1 * x'_2) \oplus x_4$ Assume that this expression contains four variables x_1, x_2, x_3, and x_4. **(8)**

b) Find the complement of every element of the lattice $<S_n, D>$ for n = 75. **(6)**

Q10. a) Obtain minimal expression using K-map **(7)**

i. f(a. b. c. d) = Σ(0, 2, 6, 7, 8, 9, 13, 15)

ii. f(a, b, c, d) = Σ(0, 2, 8, 10)



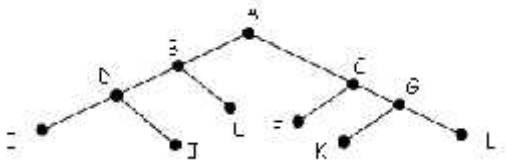
b) Define: i. Lattice ii. Sub lattice iii. Latice Homomorphism. **(6)**

UNIT 6

Q11. a) What do you mean by isomorphic diagraph? Show that following diagraphs are isomorphic, **(7)**

b) Show that in a complete binary tree the total number of edges is given by $2(n_t - 1)$, where n_t is the number of terminal nodes. **(7)**

Q12. a) Traverse the following with three techniques: inorder, preorder and post order. **(7)**



b) Give the Warshall's algorithm for path with example. **(7)**