SUMMER-2012

UNIT-1

Q.1 a) Show that $(P \vee Q) \wedge (\neg P \wedge (P \wedge Q)) \Leftrightarrow (\neg P \wedge Q)$. **(7)**

b) Obtain disjunctive normal form of $\neg(P \vee Q) \leftrightarrow (P \wedge Q)$ **(6)**

Q.2 a) Obtain principle disjunctive normal form of

$(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$ **(6)**

b) What is tautology? Show that

$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology. **(7)**

UNIT-2

Q.3 a) Show that $R \wedge (P \vee Q)$ is a valued conclusing form the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$. **(7)**

b) What do you mean by Predicate? Symbolize the expression "All the world loves a lover" **(6)**

Q.4 a) Show that $S \vee R$ is a tautology implied by

$(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ **(6)**

b) Show that $(\exists x)M(x)$ follows logically from the premises $(x)(H(x) \rightarrow M(x))$ and $(\exists x)H(x)$ **(7)**

UNIT-3

Q.5 a) Draw Venn diagram to illustrate

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ A, B, C are any three sets. **(7)**

b) Let $P = \{\langle 1,2\rangle, \langle 2,4\rangle, \langle 3,3\rangle\}$ and $Q = \{\langle 1,3\rangle, \langle 2,4\rangle, \langle 4,2\rangle\}$ show that **i.** $D(P \cup Q) = D(P) \cup D(Q)$ **ii.** $R(P \cap Q) = R(P) \cap R(Q)$ **(7)**

Q.6 (a) i) What is equivalence relation? Explain with example.

ii. Give general properties of binary operation. **(6)**

b) Draw Venn diagrams showing **(8)**

i. $A \cup B \subset A \cup C$ but $B \not\subseteq C$

ii. $A \cap B \subset A \cap C$ but $B \not\subseteq C$

iii. $A \cup B = A \cup C$ but $B \neq C$

iv. $A \cap B = A \cap C$ but $B \neq C$

UNIT-4

Q.7 a) Design composition table for algebraic system.
$(Z_m, +_m)$ and $(Z_m, *_m)$ where m = 5. **(6)**

b) Find all subgroups of

i. $(Z_{12}, +_{12})$ **ii.** $(Z_5, +_5)$

Q.8 a) Find out left coset of H in $(Z_4, +_4)$ $H = \{[0],[2]\}$ **(6)**

b) Define terms

i. Group **ii.** Monoid Homomorphism

iii. Semi group **iv.** Semigroup Homonorphism **(6)**

Q.9 a) Find minimum sum-of-products expression of following function using k-map.

i. $f(a,b,c) = \Sigma\,(0, 1, 4, 6)$ **(3)**

ii. $f(a, b, c, d) = \Sigma\,(0, 5, 7, 8, 12, 14)$ **(4)**

b) Obtain sum of product canonical form of –

i. $x_1 \oplus x_2$ **ii.** $x_1 \oplus (x_2 * x_3)$ **(5)**

UNIT-5

Q.10 a) Obtain sum of products canonical forms –

i. $(x \oplus y) * (y \oplus z)$ **ii.** $(x * z) \oplus (x * y)$ **(8)**

b) Define terms:

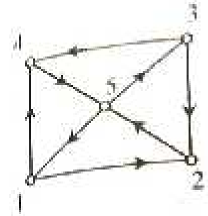
i. Lattice **(2)**

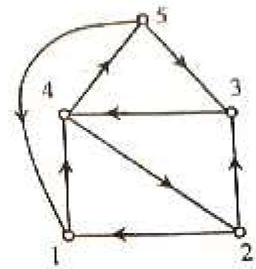
ii. Sub lattice **(2)**

iii. Direct product **(3)**

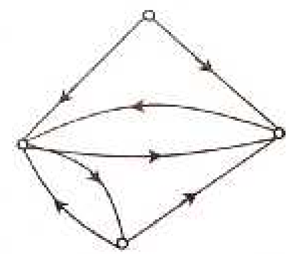
UNIT-6

Q.11 a) What do you mean by isomorphic diagraph? Show that following diagraphs are isomorphic. **(6)**





b) What is adjacency matrix? Obtain adjacency matrix of following diagraph. Also find paths of length of 1 and 2 form v_1 to v_4. **(7)**



Q.12 a) Find complement of diagraph in the Q.11(b) **(6)**

b) What do you mean by reachability? Find indegee, out degree and elementary cycles of the graph given below. **(7)**