SUMMER-2016

UNIT 1

Q1. a) What is well formed formula? What are the rules for generating well-formed formula? **(6)**

b) Show that the following equivalence:

$(((Q \wedge A) \rightarrow C) \wedge (A \rightarrow (P \vee C))) \Leftrightarrow ((A \wedge (P \rightarrow Q)) \rightarrow C$ **(7)**

Q2. a) Show that

$\neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$ **(6)**

b) Obtain the principle disjunctive normal form of

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

UNIT 2

Q3. a) Show that $R \vee S$ follows logically from the premises:

$C \vee D$, $(C \vee D) \rightarrow \sim H$, $\sim H \rightarrow (A \wedge \sim B)$ and $(A \wedge \sim B) \rightarrow (R \vee S)$. **(6)**

b) Show that, **(7)**

$(x)\ (P(x) \rightarrow Q(x)) \wedge (x)\ (Q(x) \rightarrow R(x)) \Rightarrow (x)\ (P(x) \rightarrow R(x))$

Q4. a) Determine whether the conclusion C follows logically from the premises H_1 and H_2:

i. H_1: $P \rightarrow Q$ H_2: $\neg P$ C: Q

ii. H_1: $P \rightarrow Q$ H_2: $\neg(P \wedge Q)$ C: $\neg P$ **(8)**

b) Symbolize the following statement:

i) All cats are animal ii) Some real no. are rational **(8)**

UNIT 3

Q5. a) Explain different properties of Binary Relation example. **(6)**

b) Draw Venn diagram of

i. $A \cup B = A \cup C$ but $B \neq C$ ii. $A \cap B = A \cap C$ but $B \not\subset C$.

iii. $A \cup B \subset A \cup C$ but $B \not\subset C$ iv. $A \cap B = A \cap C$ but $B \neq C$. **(7)**

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Q6. a) Let P = {<1, 2>, <2, 4>, <3, 3>} and Q = {<1, 3>, <2, 4>, <4, 2>}. Find $P \cup Q$, $P \cap Q$, D(P), D(Q), R(P), R(Q), $D(P \cup Q)$ and $R(P \cap Q)$.

Show that $D(P \cup Q) = D(P) \cup D(Q)$ **(6)**

b) Let, R and S be the relation given by:

R: { < 1, 2 > < 3, 4 > < 2, 2 > } S: { < 4, 2 > < 2, 5 > < 3, 1 > < 1, 3 > }

Find R·S, S·R, R·R, S·S, R·(S·R), (R·S)·R, R·R·R. **(7)**

UNIT 4

Q.7 a) Explain : i. Group ii. Semi Group iii. Monoid iv. Subgroup **(6)**

b) Show that with every element in group is its own inverse then group must be abelian group. **(6)**

Q.8 a) Design composition table for algebraic system

i. $< z_6, +_6 >$ and $< z_6, *_6 >$. ii. $<z_7, +_7>$ and $<z_7, *_7>$ **(6)**

b) Find out left cosets of H in: $< z_4, +_4 > = \{[0], [2]\}$. **(6)**

UNIT 5

Q9. a) Draw the diagram of the lattice $<S_n, D>$ for n = 4, 12, 15, 60. **(8)**

b) Obtain the sum of product canonical form for the following Boolean expression:

$F_1(w, x, y, z) = xy + w'yz$

$F_2(x, y, z) = xy' + y'z'$ **(8)**

Q10. a) Use K-map representation to find the minimal sum of products expression of each if the following functions:

i. f (a, b, c) = 3(0, 1, 4, 6) **ii.** f (a, b, c, d) = 3(0, 1, 2, 3, 13, 15)

iii. f(a, b, c, d) = Σ(0, 5, 7, 8, 12, 14) **(8)**

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b) For the following function given: $F = \overline{W} + y(\overline{x} + \overline{z})$

i) Circuit diagram representation

ii) Truth table representation

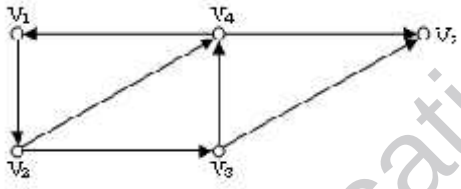
iii) K-map representation. **(7)**

UNIT 6

Q. 11 a) Define the following terms

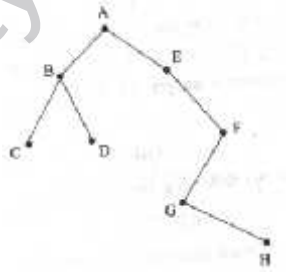
i. Graph ii. Degree of Graph iii. Tree **(6)**

b) Find all indegree and outdegree of the node of the graph given below. Give all elementary cycle of graph: **(7)**



Q.12 a) Give a directed tree representation of the formula $(P \vee (\sim P \wedge Q)) \wedge ((\sim P \vee Q) \wedge \sim R)$. From this representation obtain the corresponding prefix formula. **(6)**

b) Transverse the following tree with preorder, postorder and inorder: **(6)**



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