SUMMER-2018

UNIT 1

Q.1 a) Show the following equivalence:

i. $A \rightarrow (P \vee C) \Leftrightarrow (A \wedge \neg P) \rightarrow C$

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

b) Obtain Principle Conjunctive Normal form of

$(\neg P \rightarrow R) \wedge (Q \rightleftarrows P)$ **(6)**

Q.2 a) Prove the following equivalent equivalence without using Truth table:

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

b) Explain with example: **(7)**

i. Tautology **ii.** Contradiction **iii.** Equivalent formulas.

UNIT 2

Q.3 a) Show that.

$(x)\ (P(x) \rightarrow Q(x)) \wedge (x)\ (Q(x) \rightarrow R(x)) \Rightarrow (x)\ (P(x) \rightarrow R(x))$ **(6)**

b) Show that $S \vee R$ is tautological implied by

$(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$ **(7)**

Q.4 a) Determine whether the conclusion C follows logically from premises H_1 and H_2:

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

ii. $H_1: P \rightarrow Q$ $H_2: \neg(P \wedge Q)$ $C: \neg P$ **(7)**

b) Symbolize the following statements:

i. All cars animals **ii.** Some real number are rational. **(6)**

UNIT 3

Q.5 a) Let R and S be the given relations as

$R = |<1, 2>, <3, 4>, <2, 2>|$

$S = |<4, 2>, <2, 5> <3, 1>, <1, 3>|$

Find RoS, SoR, RoR, Ro(SoR), (RoS)oR, RoR, SoS. **(7)**

b) Draw Venn Diagram of

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

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

iii. $A \cup B \subset A \cup C$ but $B \not\subseteq C$. **(7)**

Q.6 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 $R(P \cap Q)$

Also, show that

$D(P \cup Q) = D(P) \cup D(Q)$ and $R(P \cap Q) \subseteq R(P) \cap R(Q)$. **(7)**

b) Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{<x, y> | (x - y)$ is divisible by $3\}$ Show that R is an equivalent relation. Draw the graph of R. **(7)**

UNIT 4

Q.7 a) What is coset? Find the left coset of $\{|0|, |3|\}$ in the group $<z_6, +_6>$ **(6)**

b) Convert the following infix expression to prefix and postfix:

i. (A + B)/(C – D) **ii.** (A * B) + (C * (D/F)) **(7)**

Q.8 a) Write down the composition table for

i. $<z_7, +_7>$ **ii.** $<z_7, *_7>$ **(7)**

b) Explain **i.** Group **ii.** Semi-Group **iii.** Monoid. **(6)**

UNIT 5

Q.9 a) For the following function: F = x + y + z

Give **i.** Circuit diagram

ii. Truth-Table representation

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

b) Prove the following Boolean identities,

i. a + (a' * b) = a + b **ii.** a * (a' + b) = a * b. **(7)**

Q.10 a) Draw lattice diagram of $<S_n, D>$ for n = 12, 24, 45 **(7)**

b) Use k-map representation to find minimal sum of product expression for

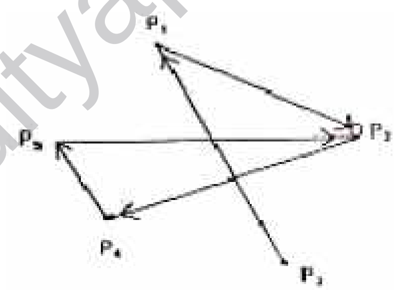
i. f(a, b, c) = Σ(0, 1, 4, 6)

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

UNIT 6

Q.11 a) Show that in a complete binary tree total number of edges is given by $2(n_t - 1)$, where n_t is the number of terminal nodes. **(7)**

b) Obtain adjacency matrix and path matrix of the diagraph given below **(6)**



Q.12 a) Give the directed tree representation of the following formula $(P \vee (\urcorner P \wedge Q)) \wedge ((\urcorner P \wedge Q) \wedge \urcorner R)$ **(6)**

b) Traverse the following with three techniques: inorder, preorder, postorder **(7)**