www.adityapublication.com

WINTER-2016

UNIT-1

Q.1 a) What is statement formula? What are the rules to generate well-formed formula. **(6)**

b) Show the following equivalences:

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

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

Q.2 a) Obtain the principle conjunctive Normal form $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$. **(6)**

b) Show that. $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$. **(7)**

UNIT-2

Q.3 a) Show that. $(x)\ (P(x) \rightarrow Q(x)) \wedge (x)\ (Q(x) \rightarrow R(x)) \Leftrightarrow (x)\ (P(x) \rightarrow R(x))$. **(6)**

b) Symbolize the following statements:

i. Some cats are black

ii. All Indians are brave

iii. Some real numbers are rational **(7)**

Q.4 a) Determine whether the conclusion C follows logically from the premises H_1, H_2, H_3:

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

ii. $H_1 : P \vee Q$ $H_2 : P \rightarrow R$ $H_3 : Q \rightarrow R$ $C:R$ **(7)**

b) Show that $R \rightarrow S$ can be derived from the premises: $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ & Q **(6)**

UNIT-3

Q.5 a) Explain with example

i. Intersection **ii.** Union **iii.** Relative complement.**(6)**

b) Let X = {1, 2, 3} and f, g, h, s be the function from X to X given by:

$$f = \{\langle 1, 2\rangle, \langle 2, 3\rangle . \langle 3, 1\rangle\} g = \{\langle 1, 2\rangle . \langle 2, 1\rangle . \langle 3, 3\rangle\}$$

www.adityapublication.com

www.adityapublication.com

$h = \{\langle 1, 1\rangle.\langle 2, 2\rangle.\langle 3, 1\rangle\} s = \{\langle 1, 1\rangle.\langle 2, 2\rangle.\langle 3, 3\rangle\}$

Find f, g, g. f, f. h. g, g. s, s. s, f. s and s. s. s. **(8)**

Q.6 a) Find the Venn diagrams showing:

i. $A \cap B = A \cap C$ But $B \neq C$

ii. $A \cup B = A \cup C$ But $B \neq C$

iii. $A \cap B = A \cap C$ But $B \not\subset C$. **(6)**

b) Let $P = \{\langle 1, 2\rangle, \langle 2,4\rangle.\langle 3, 3\rangle\}$ $Q = \{\langle 1, 3\rangle.\langle 2, 4\rangle.\langle 4, 2\rangle\}$

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 $D(P \cup Q) = D(P) \cup D(Q)$. **(8)**

UNIT-4

Q.7 a) Write down the composition table for $\langle Z_6, +_6\rangle$ and $\langle Z_6, *_6\rangle$ **(6)**

b) Show that if every element in a group is its own inverse then the group must be abelian group. **(7)**

Q.8 a) What is Coset? Find the left coset of {[0], [4]} is group $\langle Z_7, +_7\rangle$. **(7)**

b) What is algebraic structure? Write down the properties of algebraic structure. **(6)**

UNIT-5

Q.9 a) Obtain the sum of product canonical form for the following expression: **(8)**

i. f(x, y, z) = xy' + z

ii. f(w, x, y, z) = w + yz' + x'z.

b) Draws the diagram of lattice $\langle S_n, D\rangle$ for n = 6, 12, 45, 60. **(6)**

Q.10 a) Use K-map representation to find minimal sum-of–product expression for each of the following function:

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

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

www.adityapublicaiton.com

www.adityapublication.com

b) Prove the following Boolean identities:

i. $a \oplus (a' * b) = a \oplus b$

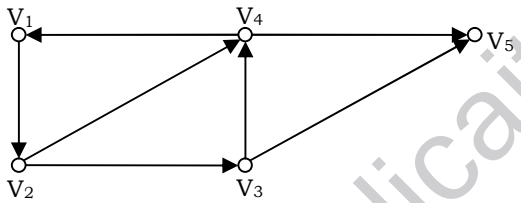
ii. $a * (a' \oplus b) = a * b$

iii. $(a * b) \oplus (a * b') = a$ **(6)**

UNIT-6

Q.11 a) Show that in a Complete binary tree the total number of edges is given by $2(n_1 - 1)$, where n_1 is the number of terminal nodes. **(6)**

b) Find all the in-degree and out-degrees of all nodes of the graph given below. Give all elementary cycles of the graph. **(7)**



Q.12 a) Give the directed tree representation of the following formula:

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

b) Obtain:

i. Adjacency matrix **ii.** Path matrix of the diagraph.

(7)

www.adityapublicaiton.com