SUMMER-2017

UNIT-1

Q.1 a) Explain with example:

- **i.** Tautology
- **ii.** Contradiction
- **iii.** Equivalence 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) Show that:

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

b) Obtain the Principal Disjunctive Normal form of:

$P \vee (\neg P \rightarrow (Q \vee (\neg Q \rightarrow R)))$ **(7)**

UNIT-2

Q.3 a) Show that:

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

b) Symbolize the following statements:

i. All apples are red ii. Roses are red and Violates are blue. **(6)**

Q.4 a) Show that the conclusion C follows from the premises H_1 H_2---- in the following cases:

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

b) Show that $(\exists x)\ M(x)$ follows logically from the premises:

$(x)\ (H(x) \rightarrow M(x))$ and $(\exists x)\ H(x)$

UNIT-3

Q.5 a) Given S = {1, 2, 3, 4 ------10} and a relation R on S. Where

R = {<x, y> | x+y=10}. What are the properties of the relation R. **(7)**

b) Let the compatibility relation on a set $\{x_1, x_2, x_3.....x_6\}$ be given by the relation.

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 maximal compatibility blocks of the relations. **(7)**

Q.6 a) List and explain the different operations that can be performed on set with example. **(6)**

b) Let P = {<1, 2>, <2, 4>, <3, 3>}

Q = {<1, 3>, <2, 4>, <4, 2>}

Find $P \cup Q, P \cap Q, D(P), R(P), R(Q), O(P \cup Q) adR(P \cap Q)\}$

Show that $D(P \cup Q) = D(p) \cap D(Q)$. **(8)**

UNIT-4

Q.7 a) Define:-

i. Semigroup **ii.** Monoid **iii.** Group. **(6)**

b) Design composition table for algebraic structure:

i. $<Z_6, +6>$ and $<Z_6, *6>$ **ii.** $<Z_7, +7>$ and $<Z_7, *7>$.

Q.8 a) What is coset? Find the left coset of H in $<Z_4, +_4>$, H={ [0].[2] } **(7)**

b) Convert the following infix expressions into prefix and postfix expressions.

i. (A*B) + (C/D) **ii.** (A-B) / ((C*D) + E) **(6)**

Q.9 a) Write the following Boolean expressions in an equivalent sum-of-product canonical form of three variables x_1, x_2, x_3.

i. $x_1 * x_2$ **ii.** $x_1 \oplus x_2$ **iii.** $x_1 \oplus (x_2 * x'_3)$ **(9)**

b) Draw the diagram of the lattice $\langle s_n, D \rangle$ for:

n = 4, 8, 15, 60. **(5)**

UNIT-5

Q.10 a) For the following function :

f = x + y + z

i. Circuit diagram representation.

ii. Truth Table representation

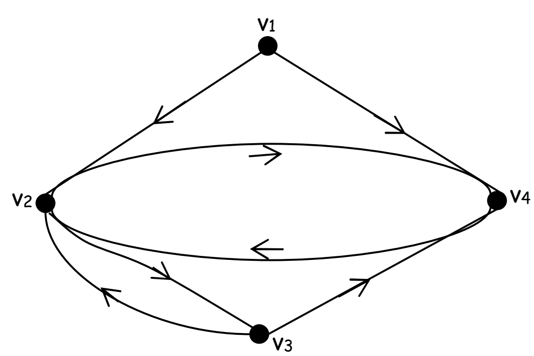
iii. k-map representation. **(8)**

b) In any Boolean algebra show that :

i. $a = 0 \Leftrightarrow ab' + a'b = b$ **ii.** $a = b \Leftrightarrow ab' + a'b = 0$ **(6)**

UNIT-6

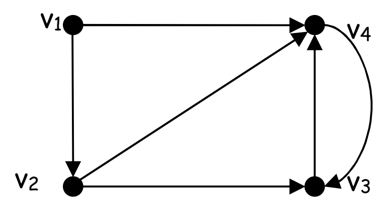
Q.11 a) Obtain the adjacency matrix A of the diagraph shown below. Find the elementary path of length 1 and length 2 from node V_1 to V_4 show that there is also a sample path of length 4 from V_1 to V_4. Also find A^2, A^3 and A^4. **(7)**



b) Give the directed tree representation of the following formula:

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

Q.12 a) Give three different elementary paths from node u_1 to u_3 diagraph shown in the following fig. What is the shortest distance between u_1 and u_3? Is there any cycle in the graph? **(7)**



b) Explain with Example:

i. Graph

ii. Indegrees and outdegrees of node.

iii. Degree of a node. **(6)**