

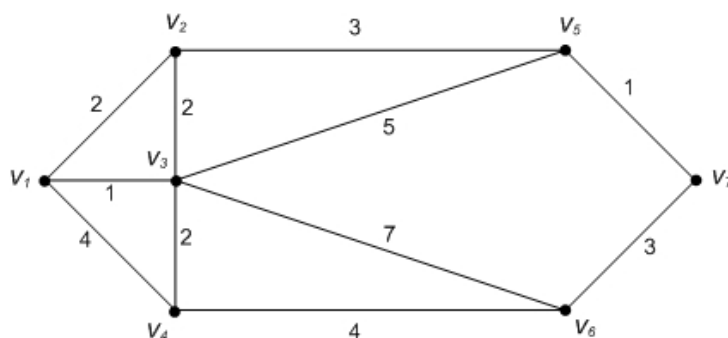


Answer any FIVE Questions

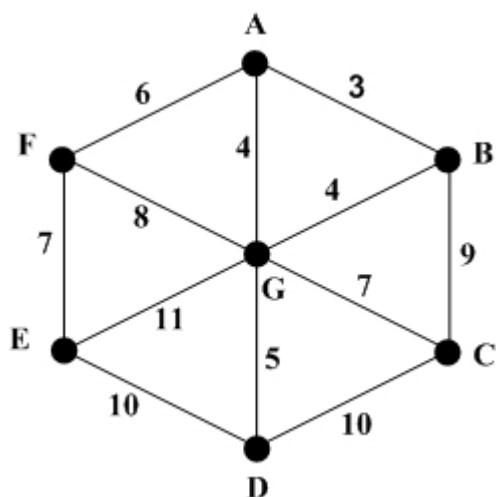
(5 X 20 = 100 Marks)

1. a) Prove that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ [5]
 b) Without using truth table find the Principle conjunctive normal form and Principle disjunctive normal form of $P \rightarrow (Q \wedge P) \wedge (\neg P \rightarrow (\neg Q \wedge \neg R))$ [10]
 c) Show that $R \wedge (P \wedge Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R, P \rightarrow M$ and $\neg M$. [5]
2. a) Let G denote the set of all matrices of the form $\begin{bmatrix} X & X \\ X & X \end{bmatrix}$ where $X \in R^+$. Prove that G is a group under matrix multiplication. [8]
 b) State and prove Lagrange's theorem for groups. [5]
 c) Determine the group code (3, 6) using the parity check matrix H is given by [7]

$$H = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
3. a) Let $(L, \leq)$ be a lattice in which * (meet) and $\oplus$ (join) denote the operations. Prove that for any $a, b \in L$, $a \leq b \Leftrightarrow a * b = a \Leftrightarrow a \oplus b = b$ [10]
 b) S_{42} is the set of all divisors of 42 and D is the relation "divisor of" on S_{42} , prove that (S_{42}, D) is a complemented lattice. [5]
 c) State and prove De-Morgan's law for lattice. [5]
4. a) Obtain the product of sums canonical form in three variables of the Boolean expression $X_1 * X_2$ [5]
 b) In any Boolean algebra prove that $(a + b')(b + c')(c + a') = (a' + b)(b' + c)(c' + a)$ [5]
 c) Simplify the following Boolean function by using Quine- McCluskey method [10]
 $f(w, x, y, z) = wxyz + wxy\bar{z} + \bar{w}\bar{x}yz + w\bar{x}\bar{y}z + \bar{w}\bar{x}yz + \bar{w}x\bar{y}\bar{z} + \bar{w}x\bar{y}z + \bar{w}x\bar{y}z$
5. a) Prove or disprove the validity of the following argument (i) "All men are fallible" (ii) "all kings are men" The conclusion is "all kings are fallible". [10]
 b) Using Dijkstra's algorithm to find the shortest path from v_1 to v_7 [10]



6. a) Explain the three kinds of tree traversal in graphs. Give examples. [10]
 b) Find the minimum spanning tree of the following graph by using kruskal's algorithm. [10]



7. a) (i) Define Bipartite graph. Give example. [4]
 (ii) Define the Chromatic number and write the properties of Chromatic number. [8]
 b) Define Chromatic Partitioning and the Chromatic Polynomial. [8]

