Q.P. Code: 19HS0836 **R19**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

MCA I Year I Semester Supplementary Examinations August-2021

DISCRETE MATHEMATICS

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1 a Explain Conjunction and disjunction with suitable Examples. 6M

b Show that $(P \to Q) \wedge (Q \to R) \Rightarrow (P \to Q)$. 6M

OR

2 a Show that $(\neg P \wedge \neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$. 6M

b Show that $\forall x(P(x) \to Q(x)) \wedge \forall x(Q(x) \to R(x)) \Rightarrow \forall x(P(x) \to R(x))$. 6M

UNIT-II

3 a Solve $a_n - 4a_{n+1} + 4a_{n-2} = (1+n)^2$ given that $a_0 = 0,\ a_1 = 1$. 6M

b Solve the recurrence relation $a_n = a_{n-1} + \frac{n(n+1)}{2}$, where $a_0 = 1$ by substitution. 6M

OR

4 a Solve $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \geq 3$ with conditions $a_0 = 0,\ a_1 = 1$ and $a_2 = 10$. 6M

b Solve the recurrence relation $a_n = a_{n-1} + \frac{1}{n(n+1)}$, where $a_0 = 1$. 6M

UNIT-III

5 a If $(G,*)$ is an abelian group if and only if $(a*b)^2 = a^2 * b^2\ \forall\ a,b \in G$. 6M

b The intersection of two normal subgroups of a group is also a normal subgroup of the group. 6M

OR

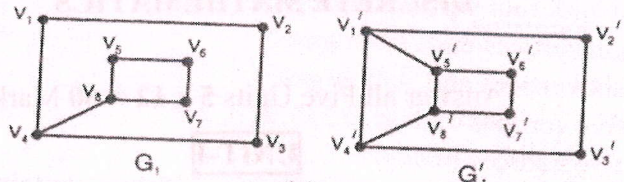
6 a The necessary and sufficient condition that a non-empty subset H of a group G to be a subgroup is $a,b \in H \Rightarrow a*b^{-1} \in H,\quad \forall\ a,b \in H$. 6M

b On the set Q of all rational number operation $*$ is defined by $a*b = a+b-ab$. Show that $(Q, *)$ forms a commutative monoid. 6M

UNIT-IV

7 **a** A graph G has **21** edges, **3** vertices of degree **4** and the other vertices are of degree **3**. Find the number of vertices in G ? 6M

b Is the following pairs of graphs are isomorphic or not ? 6M



(a)

OR

8 **a** Suppose a graph has vertices of degree **0, 2, 2, 3** and **9.** How many edges does the graph have ? 6M

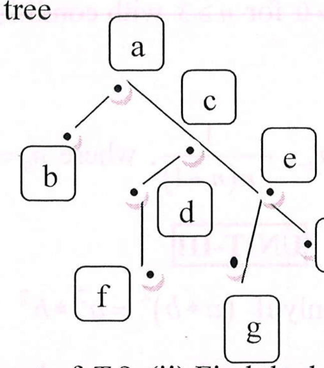
b Draw the graph represented by given Adjacency matrix 6M

(i) $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & 1 & 2 \\ 2 & 1 & 1 & 0 \\ 1 & 2 & 0 & 1 \end{bmatrix}$.

UNIT-V

9 **a** Prove that there is one and only one path between every pair of vertices in a tree T. 6M

b Consider the rooted tree 6M



(i) What is the root of T ? (ii) Find the leaves and the internal vertices of T.
(iii) What are the levels of c and e. (iv) Find the children of c and e.

Find the descendants of the vertices a and c.

OR

10 **a** Prove that the maximum number of edges in a simple disconnected graph G with n vertices and k components is $\dfrac{(n-k)(n-k+1)}{2}$ edges. 6M

b Prove that for any positive integer n, if G is a connected graph with n vertices and $n-1$ edges then G is a tree. 6M

*** END ***