

[5869] - 281

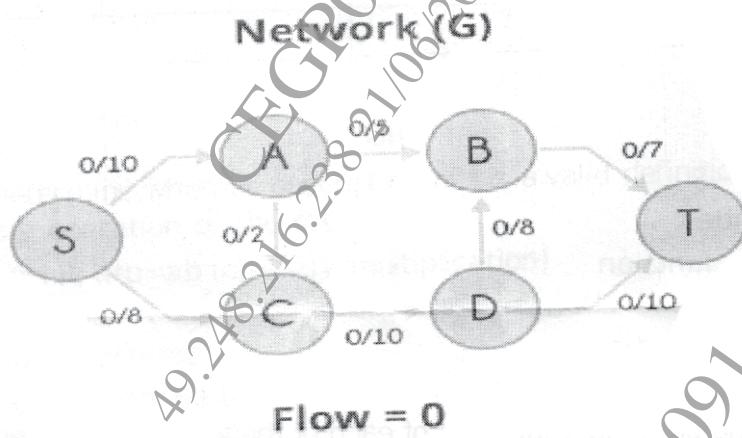
S.E. (Information Technology)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester - III)

*Time : 2½ Hours]**[Max. Marks : 70]**Instructions to the candidates :*

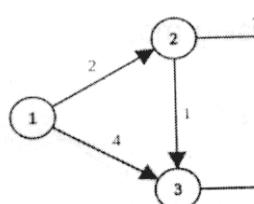
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Use of scientific calculators is allowed.
- 5) Assume suitable data if necessary.

Q1) a) What are various operations on Graph? Explain it in detail? [4]

b) Find the maximum flow in the given network. [8]



c) Find the shortest path using Dijikstra's algorithm. [6]



OR

P.T.O.

- Q2)** a) Let 'G' be a connected planar graph with 20 vertices and the degree of each vertex is 3. Find the number of edges and regions in the graph. [6]
- b) Explain the following types of graphs with the help of examples : [6]
- i) Bipartite Graph
 - ii) Complete Graph
 - iii) Regular Graph
 - iv) Spanning Subgraph
- c) Find under what conditions K_m, n the complete bipartite graph will have an Eulerian circuit. [6]

- Q3)** a) Suppose that the relation R on a set is represented by the matrix M_R . Is R reflexive, symmetric, and/or anti-symmetric? [6]

$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

- b) Find the homogeneous solution for the recurrence relation [6]
- $$A_n - 6a_{n-1} - 11a_{n-2} + 6a_{n-3} \text{ with } a_0 = 2, a_1 = 5, a_2 = 15$$
- c) Let $f(x) = x + 2, g(x) = x - 2, h(x) = 3x$, for $x \in R$ where R is the set of real numbers Find i) gof ii) fog iii) fof iv) hog v) gog. [5]

OR

- Q4)** a) Find Relation Matrix, [6]

- i) If $A = \{1, 2, 3, 4, 5, 6\}$ and $a R b$ iff a divides b for $a, b \in A$.
 - ii) $R = \{(a, b)/a < b\}$ for $a, b \in A$.
- b) Let $A = \{1, 2, 3, 4\}, B = \{a, b\}$, and $R = \{(1, a), (2, a), (3, a), (4, a)\}, S = \{(4, a), (4, b), (3, a), (3, b)\}$ [6]

Find

- i) $A \times B$
 - ii) $\sim R$
 - iii) $\sim S$
 - iv) $\sim R \cup \sim S$
- c) Describe :
- i) Identity function
 - ii) Composite function
 - iii) Inverse function

- Q5) a)** Find the prime factorization of each of the following integer. [6]
- 6647
 - 45500
 - 10!
- b)** Find integers p and q such that $51p + 36q = 3$ using Extended Euclidian algorithm. Also find GCD. [6]
- c)** Find the values of the following using modular arithmetic. [6]
- $77 \bmod 9$
 - $3110 \bmod 13$

OR

- Q6) a)** Solve the following using Fermat's Little theorem. [6]
- $769 \bmod 23$
 - $3101 \bmod 13$
- b)** Find Euler Totient Function of the following numbers. [6]
- 75
 - 5488
 - 77
- c)** Compute GCD of the following using Euclidean algorithm. [6]
- $\text{GCD}(831, 366)$
 - $\text{GCD}(2222, 1234)$

- Q7) a)** Consider the $(2, 6)$ encoding function e. $e(00) = 100000$, $e(10) = 101010$
 $e(01) = 001110$, $e(11) = 101001$
Find minimum distance of e.
How many errors will e detect? [7]
- b)** Let $R = \{0^\circ, 60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ\}$ and * = binary operation, so that $a * b$ is overall angular rotation corresponding to successive rotations by a and then by b. Show that $(R, *)$ is a Group. [6]
- c)** Prove that the following table on relation of elements of set $G = \{0, 1, 2, 3, 4, 5\}$ multiplication mod 6 is not a group. [4]

	0	1	2	3	4	5
0	0	1	2	3	4	5
1	1	2	3	4	5	0
2	2	3	4	5	0	1
3	3	4	5	0	1	2
4	4	5	0	1	2	0
5	5	0	1	2	3	4

OR

- Q8) a)** Determine whether description of a^* is a valid definition of a binary operation on the set. [6]
- i) On \mathbb{R} , $a^*b = ab$ (ordinary multiplication)
 - ii) On \mathbb{Z}^+ , $a^*b = a/b$
 - iii) On \mathbb{Z} , $a^*b = ab$
 - iv) On \mathbb{Z}^+ , $a^*b = a-b$
 - v) On \mathbb{Z} , $a^*b = 2a+b$
 - vi) On \mathbb{R} , $a^*b = ab/3$
- b)** $S = \{1, 2, 3, 6, 12\}$, where a^*b is defined as LCM (a, b). [7]
Determine whether it is an Abelian Group or not.
- c)** Define Ring. [4]

