Total No. of Questions : 8]

SEAT No. :

P652

[Total No. of Pages : 4

[5869] - 281
S.E. (Information Technology)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester - III)

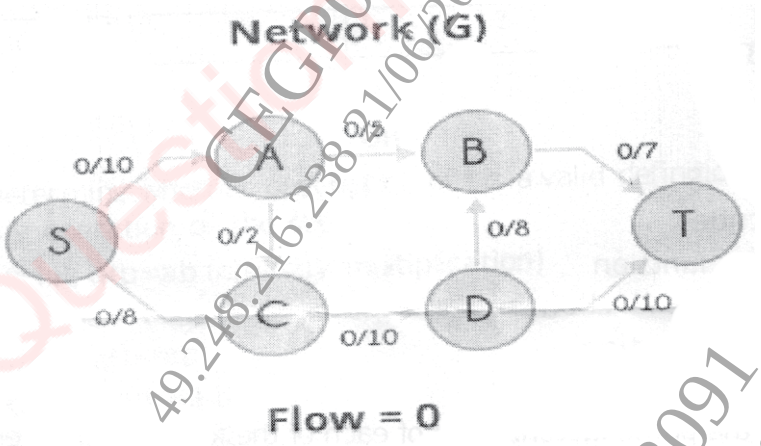
Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

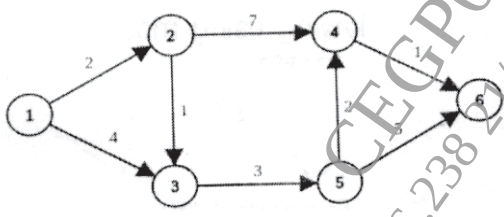
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Use of scientific calculators is allowed.***
5) ***Assume suitable data if necessary.***

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 Km, 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]**

$A_n - 6\ a_{n-1} - 11\ a_{n-2} + 6a_{n-3}$ with $a_0 = 2$, $a_1 = 5$, $a_2 = 15$

c) Let $f(x) = x + 2$, $g(x) = x\text{-}2$, $h(x) = 3x$, 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 ε A.

ii) R = {$(a, b)/a < b$} for a, b ε 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 × B ii) ~ R

iii) ~ S iv) ~ R ∪ ~ S

c) Describe : **[5]**

i) Identity function

ii) Composite function

iii) Inverse function

Q5) a) Find the prime factorization of each of the following integer. **[6]**

i) 6647 ii) 45500

iii) 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]**

i) 77 mod 9

ii) 3110 mod 13

OR

Q6) a) Solve the following using Fermat's Little theorem. **[6]**

i) 769 mod 23

ii) 3101 mod 13

b) Find Euler Totient Function of the following numbers. **[6]**

i) 75 ii) 5488

iii) 77

c) Compute GCD of the following using Euclidean algorithm. **[6]**

i) GCD (831, 366)

ii) GCD (2222, 1234)

Q7) a) Consider the (2, 6) encoding function e. e(00) = 100000, **[7]**
e(10) = 101010
e(01) = 001110, e(11) = 101001
Find minimum distance of e.
How many errors will e detect?

b) Let R = {0°, 60°, 120°, 180°, 240°, 300°} 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 * is a valid definition of a binary operation on the set. **[6]**

i) On R, a*b = ab (ordinary multiplication)

ii) On Z +, a*b = a/b

iii) On Z, a*b = ab

iv) On Z+, a*b = a-b

v) On Z, a*b = 2a+b

vi) On 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]**

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