Total No. of Questions : 8]

SEAT No. :

P-9133

[Total No. of Pages : 4

[6179]-259A

S.E. (Information Technology/A.I. & M.L. Engineering)

DISCRETE MATHEMATICS

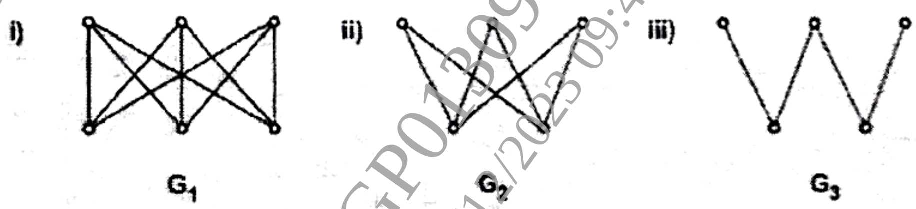
(2019 Pattern) (Semester - III) (214441/218541)

Time : 2½ Hours] *[Max. Marks : 70*

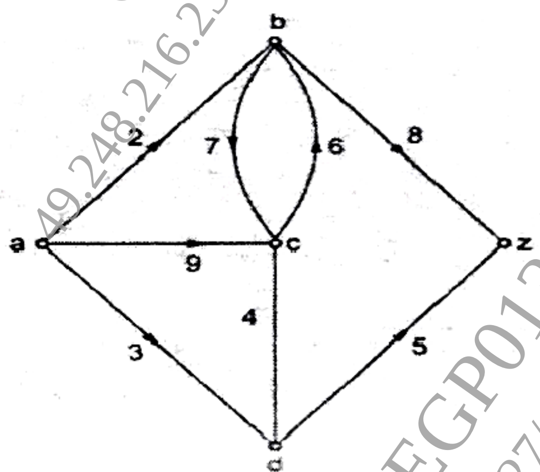
Instructions to the candidates :

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) Draw the complement of the following graphs. **[6]**



b) Using the labeling procedure, find the maximum flow in the following transport network. **[6]**



c) What is the Prefix Code? Which of the following codes are prefix codes? Justify your answer. **[6]**

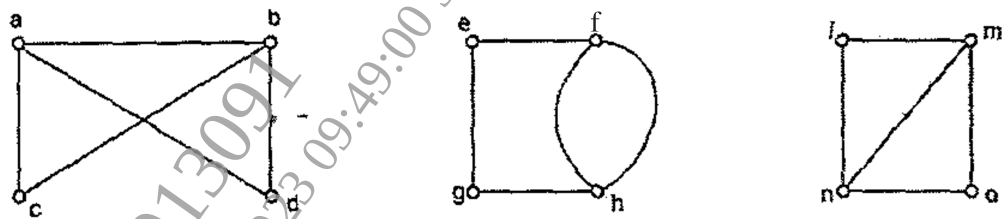
i) a : 0 ,e : 1, t : 01, s : 001

ii) a : 101, e : 11, t : 001, s : 011, n : 010

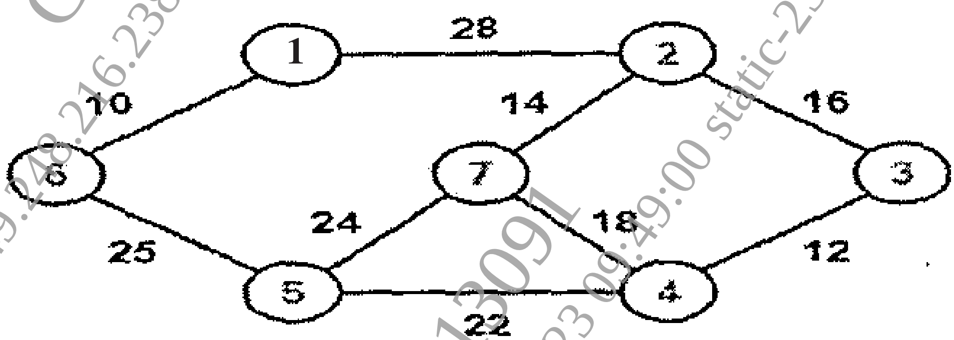
P.T.O.

OR

Q2) a) Determine whether the following graphs are isomorphic to each other. Justify your answer. **[6]**



b) Find the minimum spanning tree and weight of it for the given graph using Prim's algorthm. **[6]**



c) Suppose that sumeone starts a chain letter. Each person who receives the letter is asked to send it on to four other people. Some people do this, but others do not send any letters. How many people have seen the letter, including the first person, if no one receives more than one letter and if the chain letter ends after there have been 100 people who read it but did not send it out? How many people sent out the letter? **[6]**

Q3) a) What is Function? Given a relation R = {(1, 4), (2, 2), (3, 10), (4, 8), (5, 6)} and check whether the following relations R1, R2, R3 & R4 are functios or not. **[6]**

R1 = {(1, 4), (2, 4), (3, 4), (4, 4), (5, 4)}

R2 = {(1, 2), (2, 4), (2, 10), (3, 8), (4, 6), (5, 4)}

R3 = {(1, 6), (2, 2), (4, 4), (5, 10)}

R4 = {(1, 6), (2, 2), (3, 2), (4, 4), (5, 10)}

b) Solve the following recurrence relation. **[6]**

$a_n = 5n_{n-1} - 6a_{n-2}$ where $a_0 = 2$ and $a_1 = 5$.

c) Show that 7 colors are used to paint 50 bicycles, then at least 8 bicycles will be of the same color. **[5]**

OR

Q4) a) Find the transitive closure by using Warshall's algorithm for the given relation as : **[6]**

$R = \{(1, 1), (1, 4), (2, 1), (2, 2), (3, 3), (4, 4)\}$

b) Define POSET. Let A is set of factors of positive integer m and relation is divisibility on A. i.e. $R = \{(x, y)| \ x, y \in A, x \text{ divides } y\}$. **[6]**

For m = 45. Draw Hasse Diagram.

c) Given $f(x) = x^2 + 3$ and $g(x) = 3x - 2$. Find f(5), g(3), gof(x) and fog(x). **[5]**

Q5) a) Which of the following congruences is true? Justify your answer. **[6]**

i) $556 \equiv 1296 \pmod{10}$

ii) $1655 \equiv 935 \pmod{11}$

iii) $448 \equiv 784 \pmod{56}$

b) Compute GCD of the following numbers using Euclidean Algorithm. **[6]**

i) GCD (765, 150)

ii) GCD (343, 1554)

c) Using Chinese Remainder Theorem, find the value of P using following data. **[6]**

$P \equiv 2 \pmod{5}$

$P \equiv 5 \pmod{7}$

OR

Q6) a) Find multiplicative inverse of 15 mod 26 using Extended Euclidean Algorithm. **[6]**

b) Find the Euler's totient function of the following numbers. **[6]**

i) 37

ii) 35

iii) 15

c) What is a Mersenne prime number? Which of the following numbers is the Mersenne Prime number? 71, 31, 255, 8191, 7. **[6]**

Q7) a) Let S = {1, 2, 3, 6, 12}, where a*b is defined as LCM (a, b) over set S. Determine whether it is a semigroup, group, or Abelian Group or neither. **[6]**

b) Consider the set A = {1, 3, 5, 7, 9, ...} i.e. a set of odd positive integers. Determine whether A is closed under : **[6]**

i) a*b = a+b

ii) a*b = a–b

iii) a*b = a.b (Multiplication)

iv) a*b = power (a, b)

v) a*b = 2(a + b)

vi) a*b = min (1, a, b)

c) Consider the (2, 6) encoding function e. e(00) = 000000, **[5]**

e(10) = 101010

e(01) = 011110, e(11) = 111000

Find the minimum distance of e.

OR

Q8) a) Show that $(Z_6, +)$ is an Abelian Group. **[6]**

b) Explain Ring with an example. **[6]**

c) Prove that Hamming Distance d(x, y) = 0 iff x = y where x and y are codewords. **[5]**

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