

Total No. of Questions : 8]

SEAT No. :

P9115

[Total No. of Pages : 5

[6179]-240

**S.E. (Computer Engineering/ Computer Science & Design Engineering/
Artificial Intelligence & Data Science Engineering)**

DISCRETE MATHEMATICS

(2019 Pattern) (Semester-III) (210241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

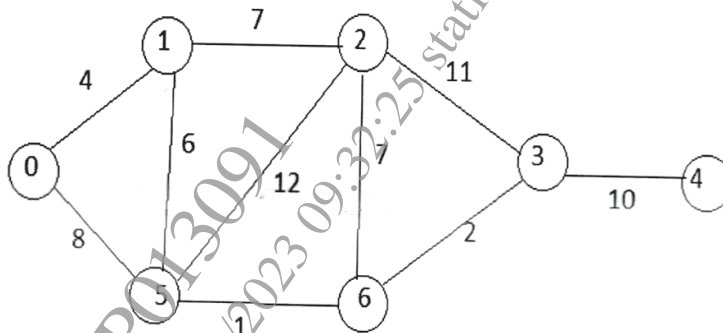
- 1) *Answer Question No. Q1 or Q2, and Q3 or Q4, and Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) How many bit strings of length 8 bits can be constructed which will either start with '1' or end with '00'? [6]
- b) In how many ways can 6 Boys and 2 Girls be seating in a row such that
- i) 2 Girls are seating together
 - ii) 2 Girls are not seating together. [6]
- c) How many bit strings can be formed of length 10 bits which contains? [6]
- i) at least four 1's
 - ii) at most four 1's?

OR

- Q2)** a) How many bit strings of length 10 can be formed which will contain either 5 consecutive 0s or 5 consecutive 1s? [6]
- b) A zip code contains 6 digits. How many different zip codes can be made with the digits 0-9 if.
- i) No digit is used more than once.
 - ii) The first digit is not '0' [6]
- c) Use the Binomial theorem to expand $(3a-2b)^6$ [6]

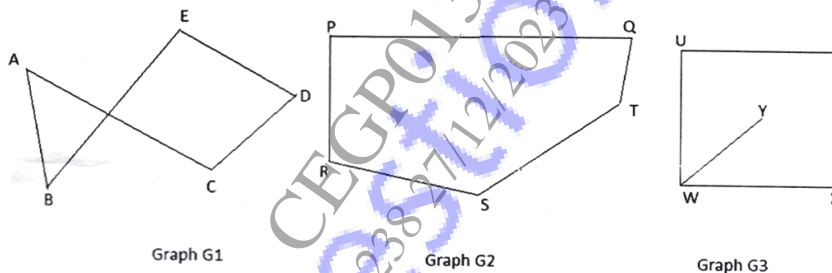
Q3) a) Find shortest path from vertex '0' to vertex '4' using Dijkstra's algorithm. [7]



b) Explain with example: [5]

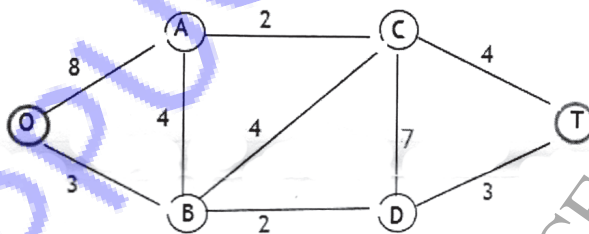
- i) Bipartite Graph
- ii) Connected Graphs

c) What is Graph isomorphism? Which of the following graphs are isomorphic? Justify your answer. [5]



OR

Q4) a) Find shortest path from vertex 'O' to Vertex 'T' using Dijkstra's algorithm. [7]

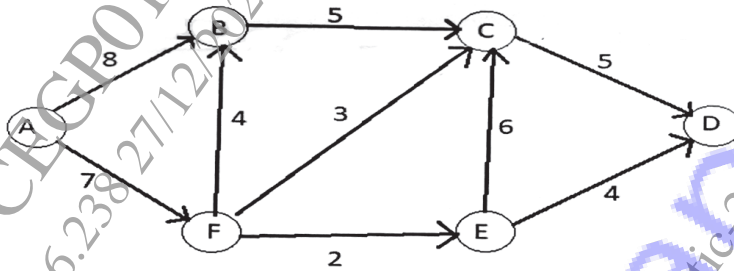


b) Explain with suitable example: [5]

- i) Euler path & Euler circuit
- ii) Hamilton path & Hamilton circuit

- c) What is planar Graph? A simple planar graph G contains 20 vertices and degree of each vertex is 3. Determine the number of regions in planar graph G? [5]

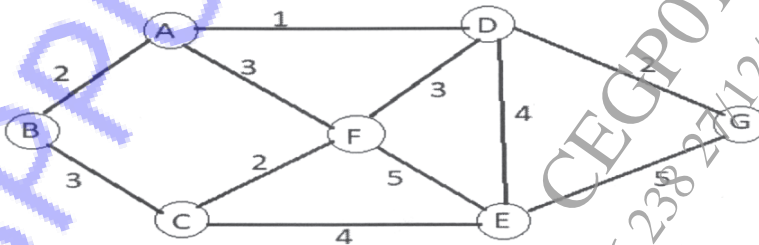
- Q5) a) For the following graph find different cut set and identify the max flow in given network? [6]



- b) Find the optimal prefix code for the given characters with the frequency of occurrences as below. [6]

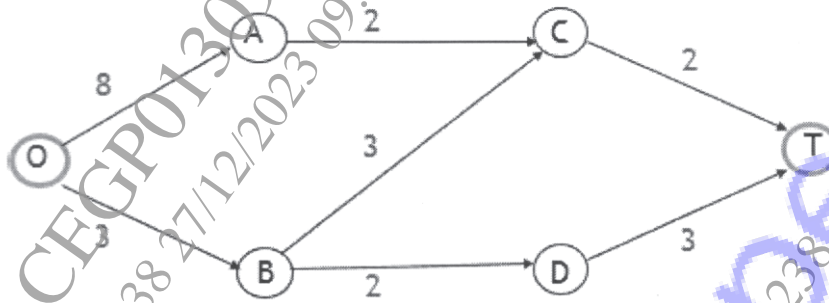
Character	Frequency
A	10
E	15
I	12
O	3
U	4
S	13
T	1

- c) Find minimum Spanning tree using prims algorithm [6]

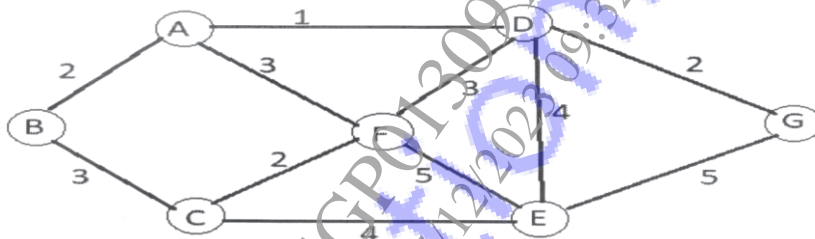


OR
3

- Q6) a)** Construct Binary search Tree: [6]
 21, 28, 14, 18, 11, 32, 25, 23, 37, 27, 5, 15, 19, 30, 12, 26
- b)** For the following transport network find the maximum flow using max flow min cut theorem. [6]



- c)** Find minimum spanning tree using Kruskals Algorithm. [6]



- Q7) a)** Let $Z_4 = \{0, 1, 2, 3\}$ and 'R' be the relation under operation '+' defined as
 $a + b = a + b$: if $(a + b) < 4$
 $a + b = a + b - 4$: if $(a + b) \leq 4$
 Where $a, b \in Z_4$
 Determine Algebraic System $(Z_4, +)$ is abelian group or not? [6]
- b)** Explain: [6]
 i) Integral domain
 ii) Field
- c)** Let $A = \{0, 1, 2, 3\}$ and 'R' be the relation under operation ' \odot ' defined as $a \odot b = a \cdot b \% 4$. Determine algebraic system (A, \odot) is monoid or not? [5]

OR

Q8) a) Let $Z_n = \{0, 1, 2, 3, \dots, n-1\}$

Consider 'R' relation under operation '+' defined as "addition Modulo 5" and operation '*' defined as "multiplication modulo 5". Does the Algebraic system. $(Z_5, +, *)$ forms Ring"? [8]

b) Explain the following properties of Algebraic structure with example [4]

i) Identity

ii) Inverse

c) Consider 'R' be the relation under binary operation '*' on a set Z. Does the algebraic system $(Z, *)$ is Abelian Group? [5]

