# S.E. (Computer Engineering/ Computer Science \& Design Engineering/ Artificial Intelligence \& Data Science Engineering) DISCRETE MATHEMATICS (2019 Pattern) (Semester-III) (210241) 

Time: $2^{1 ⁄ 2} 2$ 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 diagramo 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 '?
b) In how many ways can 6 Boys and 2 Giils be seating in a row such that
i) 2 Girls are seating together
ii) 2 Girls are not seating together.
c) How many bit strings can be formed of length 10 bits which contains?[6]
i) at least four I's
ii) at most four 1 's?

Q2) a) How many bit seings of length 10 can be formed Which will contain either 5 consecutive 0 s or 5 consecutive 1 s?
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 '
c) Use the Binomial theorem to expand $\left.(3 a-2 b)^{6}\right)^{6}$

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

b) Explain with example:
i) Bipartite Graph
ii) Connected Graphs
c) What is Graph isomorphism? Which of the following graphs are Asomorphic? Justify your answer.


OR
Q4) a) Find shortest path from vertex 'O' to Vertex 'T' using Dijkstrag's algorrithm.[7]


b) Explain with suitable example:
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?

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

b) Find the optimal prefix code for the given characters with the frequency cof occurrences as below.

Character
A
E
I
O
U
S
T

Erequency
10
15
12

3

4
13
1
c) Find minimum Spanning tree using prims algorithm


OR

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

c) Find minimum spanning tree using Kruskals Algovithm.


Q7) a) Let $Z_{4}=\{0,1,2,3\}$ and ' $R$ Cbe the relation under operation ' + ' defined as $a+b=a+b$ : if $(a+b)<40$
$a+b=a+b-4$ : if $(a+b) \leq 4$
Where $a, b \in Z_{4}$
Determine Algebraic System $\left(\mathrm{Z}_{4},+\right)$ is abellian group ornot?
(b) Explain:
i) Integral domain
ii) Field
c) Let $A=\{0,1,2,3\}$ and ' $R$ ' be the relation under operation ' $\odot$ ' defined as a $\odot \mathrm{b}=\mathrm{a}, \mathrm{b} \% 4$. Determine algebraic system $(\mathrm{A}, \odot)$ is monoid or not? [5] OR

Q8) a) Let $\mathrm{Zn}=\{0,1,2,3, \ldots \mathrm{n}-1\}$
Consider ' $R$ ' relation under operation ' + ' defined as "addition Modulo 5 " and operation '*' defined as' multiplication modulo 5". Does the Algebraic system. $\left(\mathrm{Z}_{5},+,{ }^{*}\right)$ förms Ring"?
b) Explain the following properties of Algebraic structure with example [4]
i) Identity
ii) Invesse
c) Consider ' $R$ ' be the relation under binary operation '*' on a set Z. Does the algebraic system $\left(\mathrm{Z},{ }^{*}\right)$ is Abelian Group?

