

2021

Computer Science

[M. Sc]

(CBCS)

(M.Sc. Third Semester End Examination-2021)

PAPER-303 [Elective-I]

(Graph Theory)

*Full Marks: 50*

*Time: 02 Hrs*

*The figures in the right hand margin indicate marks*

*Candidates are required to give their answers in their own words as far as practicable*

*Illustrate the answers wherever necessary*

**Group A**

1. Answer any FIVE questions of the following: **5x2=10**
- Draw at least three non-Isomorphic graph with four vertices.
  - Define complete bipartite graph with example.
  - Define chromatic partitioning with a suitable example.
  - Define hamiltonian path with example.
  - What is the maximum number of edges in a planner graph with 12 vertices
  - Distinguish between walk and circuit in a graph.
  - What is a component of a graph? When a graph is called a connected graph?
  - Write any two properties of a binary tree.

(2)

**Group B**

2. Answer any FOUR questions of the following: 5x4 = 20

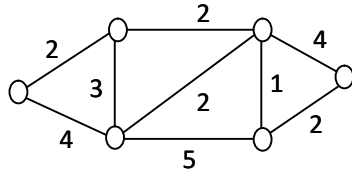
a) Prove that the sum of edges in a planner graph with 12 vertices? 5

b) Define complete graph with example.

How many more edges are there in a complete graph  $K_n$  than in the complete graph  $K_6$ ? 5

c) Prove that a simple graph with  $n$  vertices and  $k$  components can have at most  $\frac{(n-1)(n-k+1)}{2}$  edges.

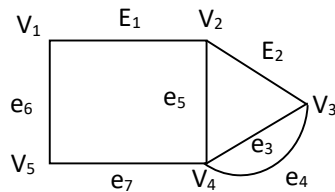
d) Construct the MST for the given graph using Prim's algorithm.



e) Prove that a given connected graph  $G$  is Eulerian if and only if all vertices of  $G$  are of even degree.

For what value of  $n$  the complete graph  $K_n$  is Eulerian.

f) Let us consider a graph  $G$  whose pictorial representation is given below:



(3)

Examine whether each of the following walks in  $G$  is (a) a trail (b) a path (c) a closed walk (d) a circuit (e) a cycle.

i)  $W_1 = (v_2, e_2, v_3, e_3, v_4, e_4, v_3)$

ii)  $W_2 = (v_4, e_7, v_5, e_6, v_1, e_1, v_2, e_2, v_3, e_3, v_4)$

**Group C**

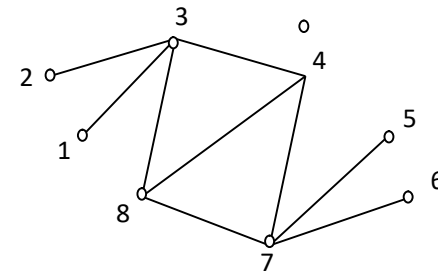
3. Answer any ONE questions of the following: 10x1 = 10

a) Define planner graph with example. Draw a Q3 graph. Is Q3 is a planner graph? justify the graph  $G$  has 6 vertices with degrees 2, 2, 3, 4, 4, 5. How many edges does  $G$  have? Could it be planner? If so, how many faces would it have? If not explain. 2+2+6

b) Define clique of a graph. What do you mean by maximal clique?

How many perfect matching are there in a complete graph with 6 vertices?

What should be the maximum matching for the given graph  $G$ . Also write down two matching sequence with matching size two. 2+2+2+2+2



**G**