

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

M.A./M.Sc. FOURTH SEMESTER EXAMINATION, MAY 2024

SECOND YEAR (BATCH 2022-24)

MATHEMATICS

Paper : CC 17

Date : 15/05/2024

Time : 11.00 am – 1.00 pm

Full Marks : 50

Answer all the questions, maximum you can score 50. [All the notations and symbols have their usual meaning.]

1. Find the length of the shortest paths from vertex 'd' to all other vertices by Dijkstra's algorithm for the graph: Fig 1 [12]

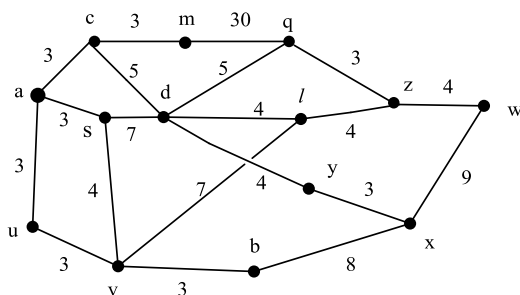


Fig : 1

2. Find the maximal flow and corresponding minimum cut for the s-t network : Fig 2 [10]

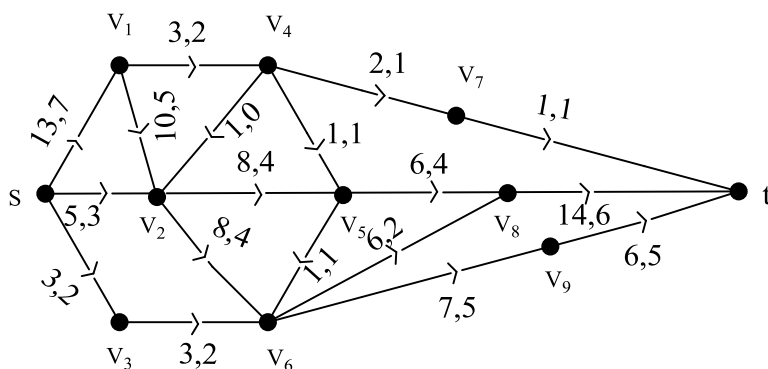


Fig : 2

3. Use Kruskal's algorithm to find MST of the graph in Fig 1. [8]
4. a) Prove that a simple graph G with p vertices and satisfying the condition $\delta(G) \geq \frac{p-1}{2}$ is connected, where $\delta(G)$ denotes minimum degree of G . [3+(1+4)+2]
- b) Define a tree. Prove that a tree with n -vertices has $(n-1)$ edges.
- c) If a graph G has exactly two vertices of odd degrees, then prove that there must be a path joining them.
5. Which of the following are graphic? [3+3]
- a) $(7, 7, 6, 6, 4, 3, 3, 2, 1, 1)$
- b) $(9, 8, 7, 6, 6, 5, 4, 4, 3, 2, 1, 1)$
6. For any simple connected planer graph G , prove that $\chi(G) \leq 6$. [5]
7. For any connected plane graph G with ' n '-vertices, ' e '-edges and ' f '-faces, prove that $n - e + f = 2$. [6]
8. Give an example of a graph which is Hamiltonian but not an Euler graph. [3]