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Paper Code: TCS-604/TIT-604

End Semester Back Paper Examination 2018

Course - BTech (CS/IT) VT<sup>th</sup> Semester

Paper Name - *Graph Theory*

Time: Three Hours

MM: 100

**Note:**

- I. This question paper contains five questions.
- II. All Questions are compulsory.
- III. Instructions on how to attempt a question are mentioned against it.
- IV. Total marks assigned to each question are twenty.

**Q 1.** (Attempt any two questions of choice from a, b and c)

a.

(5\*2= 10)

- I. Prove that – number of even degree vertices of any graph is always even.
- II. Define complete graph and complete bi-partite graph.

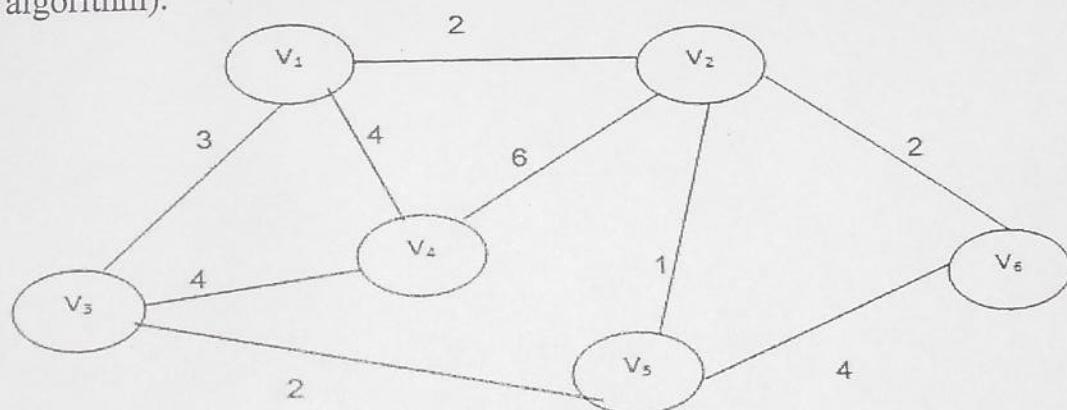
b. What is a Travelling Salesman Problem? Explain any one method to solve TSP.(Take an example to explain) (10)

c. Define (with example) – path, trail, circuit and cycle (2.5\*4= 10)

**Q 2.** (Attempt any two questions of choice from a, b and c)

a. Define – Binary Tree, Fully Binary Tree, Binary Search Tree, AVL Tree (10)

b. Find the shortest path from node 'v<sub>3</sub>' to node 'v<sub>6</sub>' in the graph given below (using Dijkstra's algorithm). (10)



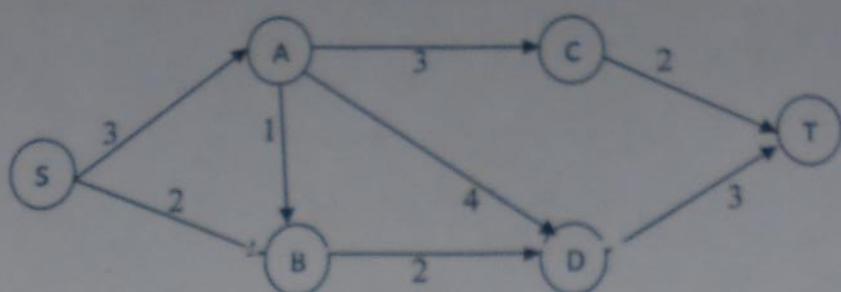
c. Define Spanning Tree. Mention some characteristics. Discuss Prim's Algorithm to find minimal spanning tree formed from a weighted graph with an example. (3+7=10)

**Q 3.** (Attempt any two questions of choice from a, b and c)

a. Draw any one graph as per the instruction-

- i) Graph which has at-least one cut-vertex but doesn't have any bridge,
- ii) Graph which has at-least one bridge but doesn't have any cut-vertex.

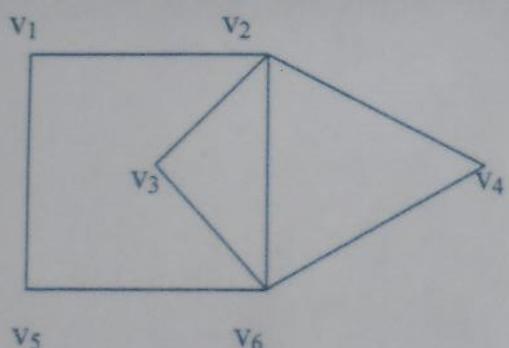
- b. Discuss the concept of network flow. Consider the network given below and solve it to show that – (here 'S' is source and 'T' is destination)  
 Maximal flow = minimal cut. (10)



- c. In cut-vertex concept Prove that - "For any non-trivial connected graph there will be at least 2 non-cut vertices". (10)

**Q 4.** (Attempt any two questions of choice from a, b and c)

- a. Write notes on –  
 i) Euler Graph  
 ii) Planar Graph and Planarity (5\*2=10)
- b. For the connected graph G given below, form incidence matrix, circuit matrix, cut-set matrix and adjacency matrix. [Name edges by your own] (10)



- c. Prove that - maximum size of a disconnected graph of order 'n' and component 'k' could be –  $(n-k)*(n-k+1)/2$  (10)

**Q 5.** (Attempt any two questions of choice from a, b and c)

- a. Define matching, maximal matching and perfect matching. Explain why - "Every maximal matching is not perfect matching". (10)
- b. Explain 4-color problem in graph coloring concept. (10)
- c. What is Chromatic number? Justify the statement given below –  
 "Chromatic Number for any graph  $\leq$  Order of the Graph" (10)