

Assignment no 3 and 4 (To be submitted together)

Binary Search trees and Graphs

Deadline: 1 April 2021

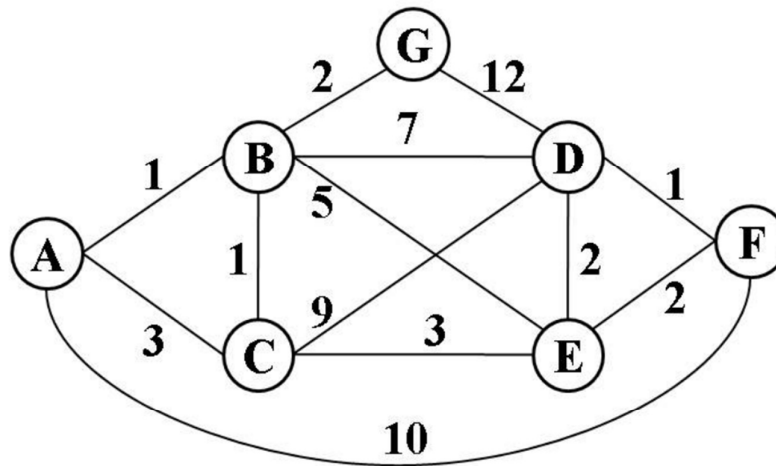
Submit the assignment to : marassignments@gmail.com

Scan the pdf clearly and properly and do not forget to attach to the email

This is theory hand written assignment

Subject of your email: Name, enrolment no complete Assignment 3 and 4

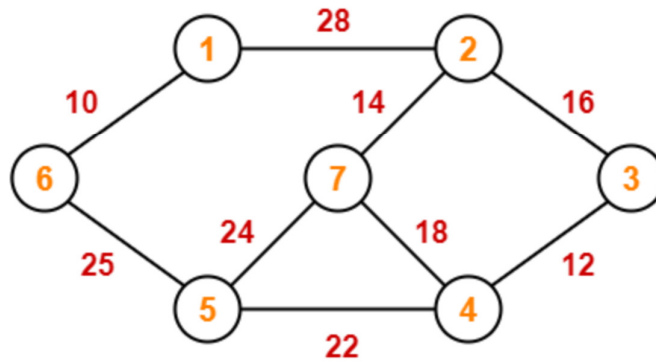
1. Consider the following undirected, weighted graph:



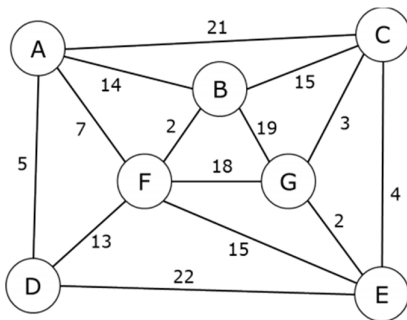
Step through Dijkstra's algorithm to calculate the single-source shortest paths from A to every other vertex. Show your steps in the table below. Cross out old values and write in new ones, from left to right within each cell, as the algorithm proceeds. Also list the vertices in the order which you marked them known. Finally, indicate the lowest-cost path from node A to node F.

2.

Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm-

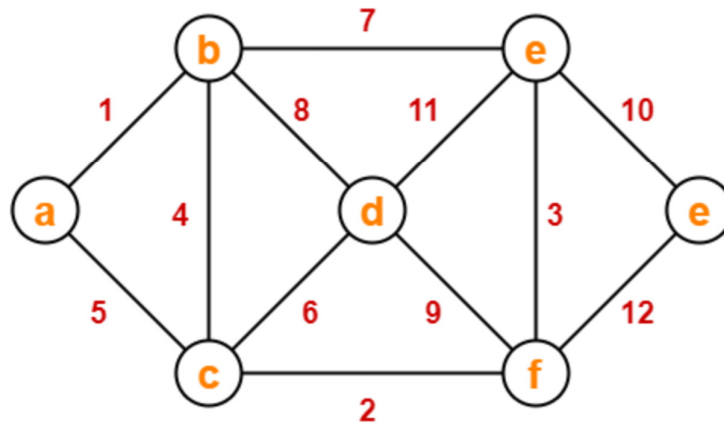


3. Find the minimum spanning tree for the following graph using Kruskal and Prim both. Show your steps.



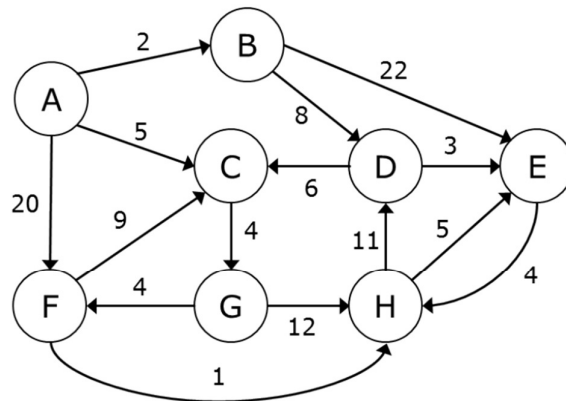
4.

Using Prim's Algorithm, find the cost of minimum spanning tree (MST) of the given graph-



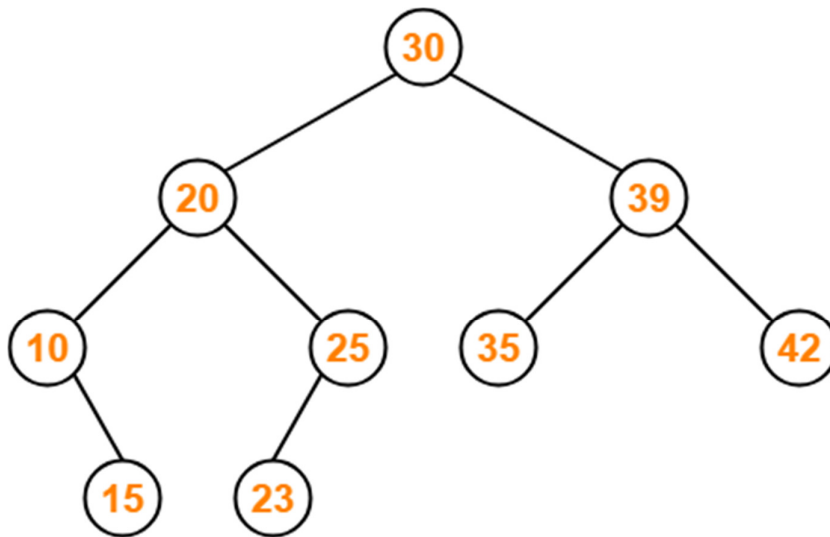
5.

Consider the following directed, weighted graph:



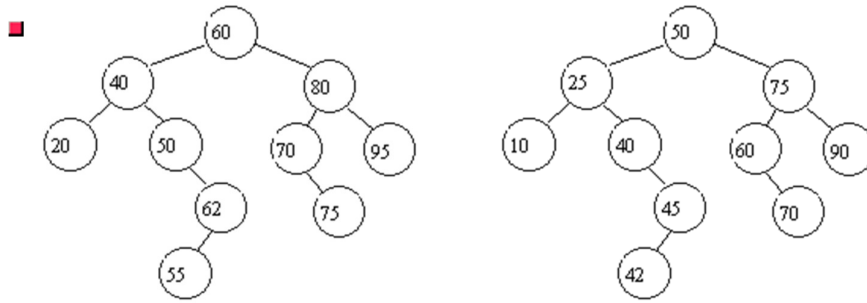
- (a) Use Dijkstra's algorithm to calculate the single-source shortest paths from vertex *A* to every other vertex. Show your steps in the table below. As the algorithm proceeds, cross out old values and write in new ones, from left to right in each cell. If during your algorithm two unvisited vertices have the same distance, use alphabetical order to determine which one is selected first. Also list the vertices in the order which Dijkstras algorithm marks them known:

6. Write the preorder, postorder and inorder traversal of the following BST.

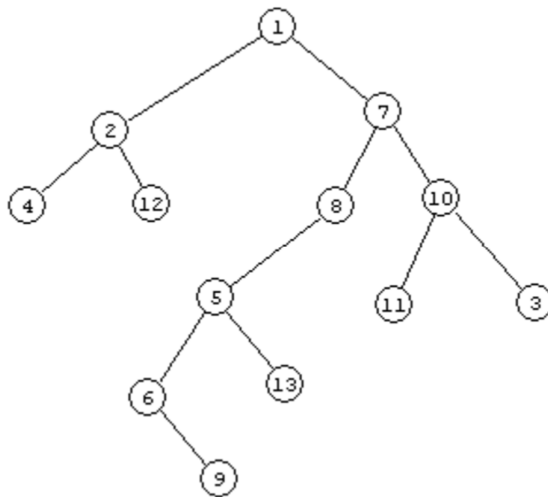


Binary Search Tree

7. Which of the following two trees is a binary search tree ?



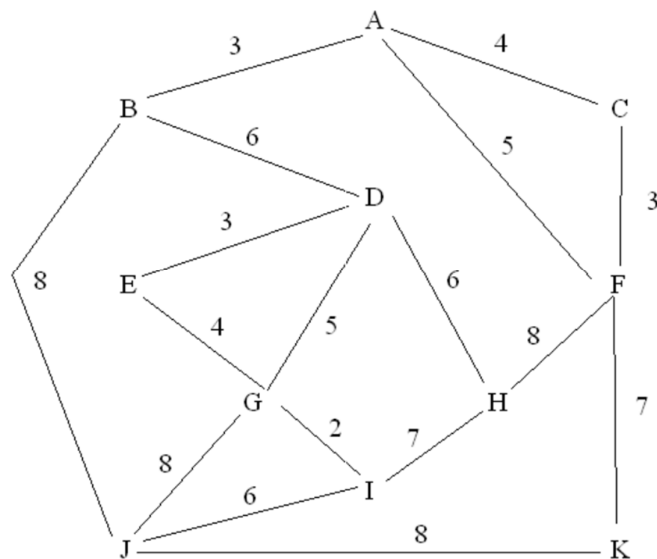
8. The picture below represents a binary search tree. The numbers shown are arbitrary node labels, not numbers representing the contents of the nodes. The contents are not shown. If node 1 is deleted, using binary search tree deletion, what will be the new root node?



9. Consider the graph in Figure 2. Unless otherwise indicated, always visit adjacent nodes in alphabetical order

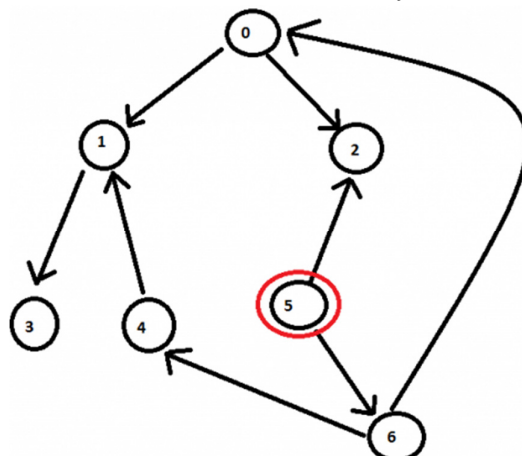
- Provide the DFS tree starting at node A.
- Provide the BFS tree starting at node A.
- Provide the DFS tree starting at node H.
- Provide the BFS tree starting at node H.
- Use Kruskal's algorithm to derive the MST.
- Use Prim's algorithm to derive the MST starting at node A.

(g) Using Dijkstra's algorithm, determine the shortest path from node A to I. Show the steps, your tables and the resulting path.



10. There are n departments in VNIT. There is a technical event on campus and so these n departments need to be linked using a communication network. The laying of the communication links between any two departments involves some cost which is proportional to the distance between the two departments. Each department must be reachable by any other department through this communication system. The problem is to minimise the cost of this project. Give an algorithm to find the minimum cost required for this project.

11. A mother vertex in a graph $G = (V, E)$ is a vertex v such that all other vertices in G can be reached by a path from v .



In this graph the mother vertex is- '5'(circled red) as we can reach any node from - '5' through a directed path

To reach 0-

5->6->0

To reach 1-

5->6->0->1

To reach 2-

5->2

To reach 3-

5->6->0->1->3

To reach 4-

5->6->4

To reach 6-

5->6

Give an algorithm to find the mother vertex in a directed connected graph. If there are more than one mother vertices, then output any one of them.