QUIZ-2

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Sub- Algorithm Analysis and Design-1 (CSE2631) **Section-23412C3**

Full Marks-10 **Time- 30 minutes**

CO3- To explain the major graph algorithms and their analyses and employ graphs to model engineering problems, when appropriate.

Question 1 Consider a simple undirected weighted graph G, all of whose edge weights are distinct. Which of the following statements about the minimum spanning trees of G is/are TRUE?

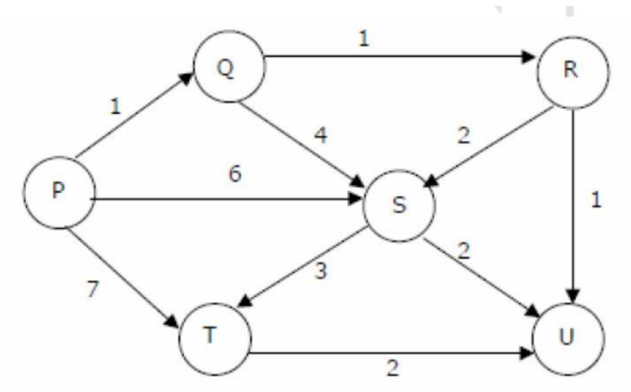
A. The edge with the second smallest weight is always part of any minimum spanning tree of G.
B. One or both of the edges with the third smallest and the fourth smallest weights are part of any minimum spanning tree of G.
C. Suppose S V $\subseteq$ be such that S $\neq \phi$ and S V$\neq$. Consider the edge with the minimum weight such that one of its vertices is in S and the other in V \ S. Such an edge will always be part of any minimum spanning tree of G.
D. G can have multiple minimum spanning trees.

Question 2

Let $G = (V, E)$ be a weighted undirected graph and let T be a Minimum Spanning Tree (MST) of G maintained using adjacency lists. Suppose a new weighted edge $(u, v) \in V \times V$ is added to G. The worst case time complexity of determining if T is still an MST of the resultant graph is

(A) $\Theta(|E| + |V|)$
(B) $\Theta(|E||V|)$
(C) $\Theta(|E| \log |V|)$
(D) $\Theta(|V|)$

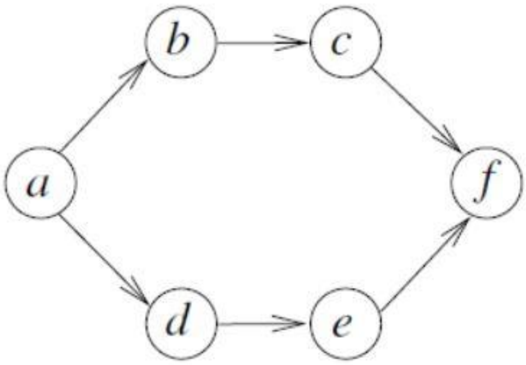
Question 3 Suppose we run Dijkstra's single source shortest-path algorithm on the following edge-weighted directed graph with vertex P as the source.



In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized?

A. P Q R S T U
B. P Q R U S T
C. P Q R U T S
D. P Q T R U S

Question 4 Consider the following directed graph:



The number of different topological orderings of the vertices of the graph is-

A. 4
B. 5
C. 6
D. 7

Question 5: Let G be a graph with n vertices and m edges. What is the tightest upper bound on the running time of Depth First Search on G, when G is represented as an adjacency matrix?

A. O(n)
B. O(n+m)
C. O(n^2)
D. O(m^2)