CS2023 - Data Structures and Algorithms

Take Home Assignment

Week 10 – MST

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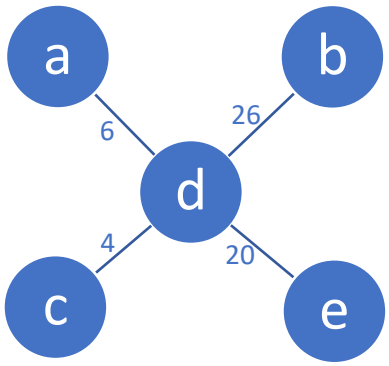
1. Both Kruskal's and Prim's algorithms are commonly used to identify minimal spanning trees (MSTs) in graphs. Kruskal's Algorithm organizes edges by weight and progressively adds them to the MST, allowing for unconnected components and any beginning vertex. It finds and manages related components effectively using a disjoint-set data structure. Prim's Algorithm, on the other hand, expands the MST from a given vertex by picking edges with the lowest weight, assuming a connected graph. Using a priority queue or heap, it efficiently picks the edge with the lowest weight. Kruskal's Algorithm is efficient for sparse graphs and has a temporal complexity of O(E log V).

2.



Cost = 56

3. A cycle detection technique may be used to assess the presence of a cycle in a minimal spanning tree (MST). This method works by merging each edge of the MST into an edge set and then checking for cycles as each edge is added. If an edge's two endpoints are already connected inside the edge set, adding this edge will result in the construction of a cycle. As a result, the edge is ignored. This approach has a temporal complexity of O(E log E), where E is the number of edges in the graph.