Problem 1) (15 pts) Use **Kruskal’s Algorithm** to identify a Minimum Spanning Tree of the following graph.
Indicate the order in which edges are added to the spanning tree.

Problem 2) (15 pts) Use **Prim’s Algorithm** to identify a Minimum Spanning Tree of the following graph.
Indicate the order in which edges are added to the spanning tree.
Problem 3) (20 pts) Let \((u, v)\) be a minimum-weight edge in a graph \(G\). Prove that \((u, v)\) belongs to some minimum spanning tree of \(G\).

Problem 4) (30 pts) Identify the Strongly Connected Components (SCC) of the following graph.

![Graph Image]

4a. (15 pts) Calculate the DFS discovery and finishing times for each node.

4b. (10 pts) Reverse the graph.

4c. (15 pts) Run a DFS on the reversed graph to identify SCCs.

Problem 5) (20 pts) Write pseudocode for Prim’s algorithm using an adjacency matrix, \(M\), that runs in \(O(V^2)\) time.

5a. (10 pts) Write the algorithm

5b. (10 pts) Calculate the runtime.