

Problem statement:

Minimum Spanning Tree using Prim's Algorithm

The provided text describes Prim's algorithm, a greedy approach for constructing a minimum spanning tree (MST) in a weighted, undirected, connected graph. In this scheme, the goal is to connect all the vertices of the graph with the minimum possible total edge weight, without forming any cycles.

Prim's algorithm begins with an arbitrary starting vertex and grows the MST by repeatedly adding the edge with the smallest weight that connects a vertex in the tree to a vertex outside it. At each step, it maintains a priority queue (or min-heap) to efficiently select the next minimum-weight edge.

The total cost of the MST is defined as:

$$\text{cost of MST} = \sum (\text{weights of all edges included in the MST})$$

The text outlines a greedy method to construct this tree by always choosing the lightest edge that expands the current partial tree while avoiding cycles. For this problem, you will develop a program that implements Prim's algorithm and a CLI that allows usable access to the code written.