This assignment is **due on Aug 21**. All submitted work must be *done individually* without consulting someone else's solutions in accordance with the University's "Academic Dishonesty and Plagiarism" policies.

Problem 1: Consider the following variant of the MST problem. We are given an undirected graph $G = (V, E)$, edge costs $c : E \rightarrow R^+$ and a subset of vertices $A \subset V$. Suppose that V represents a set of computers and A is the subset of these computers that have a single network port to connect to another computer. We would like to find the cheapest way to design a computer network that will connect all computers.

The abstract problem we are interested in solving is to find a subset $X \subseteq E$ of edges of minimum cost such that (V, X) is connected and $\deg_X(u) = 1$ for all $u \in A$.

Your task is to design an algorithm that solves this problem in $O(m \log n)$ time. You solution must include:

1. Statement of your algorithm in plain English. (Pseudo-code is optional.)

2. Short proof of correctness.

3. Time complexity analysis.