Instructions for GradeScope-friendliness: (1) please write your solutions into only the spaces provided; (2) please try to not attach extra sheets of paper beyond these.

Problem 1

Algorithm Description in English
Input: $G = (V, E)$

Pseudocode

Time Complexity
Problem 2

Justify approach is a greedy algorithm

Proof that it gives optimal solution
Problem 3

Input: $G, T, H$
Proof that $T \cap H$ is contained in some MST of $H$
Problem 4

(a) Proof that the second-best minimum spanning tree need not be unique

(b) Proof
(c) Algorithm Description in English

Input: $G = (V, E); \ T$

Output: $\max(u, v)$; for all $u, v \in V$

Pseudocode

Time Complexity
(d) Algorithm Description in English

Input: \( G = (V, E) \)

Output: second-best minimum spanning tree of \( G \)

Pseudocode

Time Complexity
Problem 5

Algorithm Description in English
Input: $T = (V, E)$
Output: minimum vertex cover of $T$

Proof of correctness
Pseudocode

Time Complexity
Problem 6

Algorithm Description in English

Input: $G = (V, E);\ s, t \in V;\ k \leq |V|$

Output: shortest path from $s$ to $t$ that contains exactly $k$ edges

Pseudocode

Time Complexity