ECE 745 – Assignment 1 Report

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Problem 1:

For this problem we are asked to simulate Prim's minimum spanning tree algorithm with a linked list as base data structure to store the undirected weighted graph, with straightforward and binary heap search method. For the linked list part, a structure pointer **Node** is created to represent each vertex, and each vertex will form a list with its adjacent neighbors (i.e.):

vertex 1 → vertex 2 →
vertex 2 → vertex 1 → vertex 9
…
vertex 9 → vertex 2 → vertex 6

As for finding minimum spanning tree of all vertices, in the first simple case, for loops are used for checking which vertex to extract. Then another for loop is used for updating the distance within the set of V's by comparing the distance of current adjacent v vertex to their previous value. Therefore, the time complexity it takes is $O(V^2)$.

When using binary heap method, a queue which smallest distance will always go to the first location. A heapifyDown and heapifyUp functions are created to sort out this heap from smallest to the biggest. Therefore, the time it takes for the two sorting functions are (2Vlog(V)).

Problem 2:

The idea is similar, where the only difference is when performing checking for the distance, instead of the weight itself of the edge between two vertices, the distance will be the sum of previous visited path's weight + the current edge's weight.