Department of Electrical and Computer Engineering
North South University

Final Term Examination
CSE 373: Design and Analysis of Algorithms
Section: 9
Fall 2020

Total Marks: 40

Total Time : 1hour 10 minutes + 10 minutes to upload

Instructions

1. Answer ALL questions
2. You should turn on the camera during the examination time
3. Answers need to be handwritten
4. The answer script needs to be uploaded via google classroom
5. You should compile your answers to a single pdf file. The name of the pdf file should be "your name"

1 Draw a diagram that shows the relationship between the following classes of problems: *P, NP, NP-hard* and *NP-complete* 5 marks

2 The network shows the length, in miles, of roads connecting eleven villages.

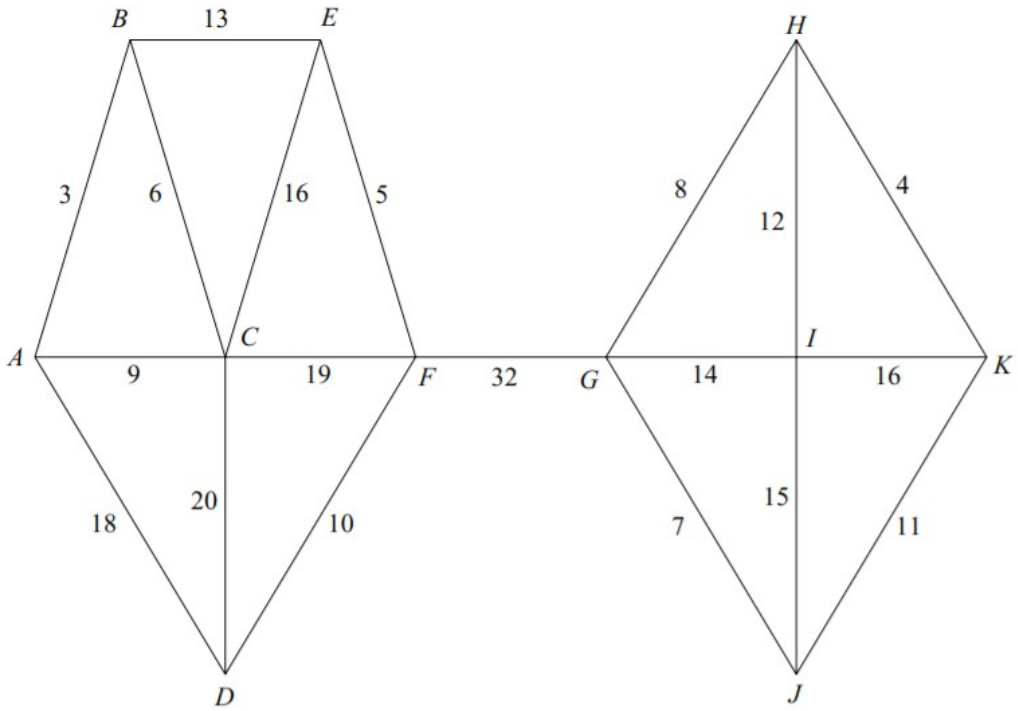

Figure 1 : A network connecting eleven villages

a) Use the Prim's algorithm, starting from A, to find the minimum spanning tree for the network. Draw your minimum spanning tree and state its length. 8 marks

b) A student used Kruskal's algorithm to find the same minimum spanning tree. Find the seventh and eighth edges that the student added to his spanning tree. 2 marks

c) Suppose you wish to explore the graph in figure 1. Starting from vertex *A*, state the sequence in which the vertices would be explored if breadth-first search (BFS) algorithms were used. Explain what is the time complexity of the algorithm. **You do not need to write down the algorithm**. 5 marks

d) Use the Dijkstra's algorithm to determine the shortest path from *A* to *K*. Priority queue data structure is used in this algorithm. Explain what is the time complexity of the algorithm if the priority queue is built using 5 marks

i) array
ii) min-heap

3 a) Explain how can you determine the longest common subsequence (LCS) of two strings using **brute force** approach. You should also explain what would be the time complexity if you are using the brute force approach. 5 marks

b) The LCS problem can also be solved using dynamic programming (DP). Find the LCS(X, Y) where X = “scholarly” and Y = “heriocally”. State the time complexity of finding the LCS of two strings using the DP approach. 10 marks