

## Department of Electrical and Computer Engineering North South University

Final Term Examination

CSE 373: Design and Analysis of Algorithms

Section: 3

Fall 2020

Total Marks: 40

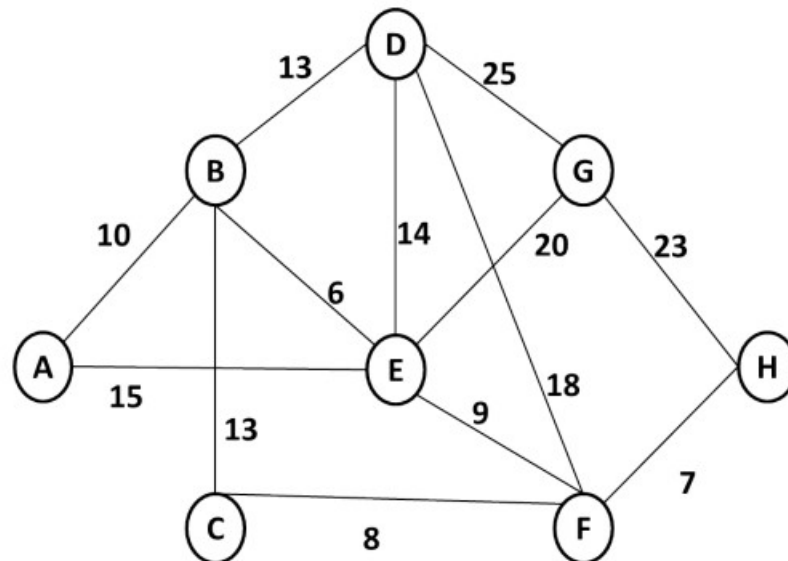
Total Time : 1hour 10 minutes + 10 minutes to upload

### 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 Consider the following graph: 10 marks

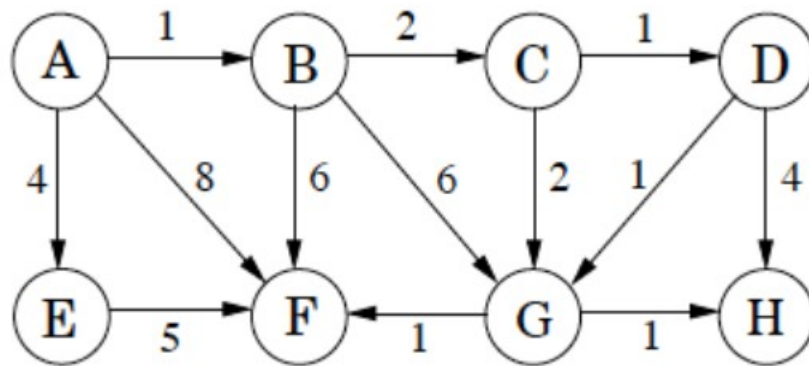


Each node in the graph represents remote Himalayan villages in Nepal devastated in a recent earthquake. Electricity distribution system in the region broke down after the incident. As an engineer, you are given the task to reestablish the connection. Each village can be connected by wire to one of its

neighboring villages at a cost denoted by the edge between them. One of the villages will be later connected to a nearby power station. Since there is a scarce of resources in this situation, you have to come up with a plan that allows to connect each villages with the minimum cost.

Identify the problem, the type of problem and solve the problem. You should show your steps carefully and must provide a graph that shows how the villages should be connected to each other. State the time complexity of the algorithm you used.

3 Consider the following graph:



Suppose, you are given the task to determine the shortest path from the source vertex *A* to any other vertices in the given graph.

- a) Which algorithm would you prefer and why? 5 marks
  - b) Determine the shortest path from *A* to *H* using your preferred algorithm. Show your steps carefully. 10 marks
  - c) Explain what would be the time complexity of the algorithm that you have chosen. You must clearly mention what data structure options do you have to implement the algorithm you chose and what would be the time complexity of the algorithm for each of the choices. Explain clearly. 5 marks
- 4 Explain clearly how can you determine the longest common subsequence of two strings using 5 marks
- a) Brute force approach
  - b) Dynamic Programming
- For each of the cases, explain what would be the time complexity of the algorithms.
- You do not need to write any algorithm.**