

Department of Electrical and Computer Engineering North South University

Final Term Examination

CSE 373: Design and Analysis of Algorithms

Section: 1

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”

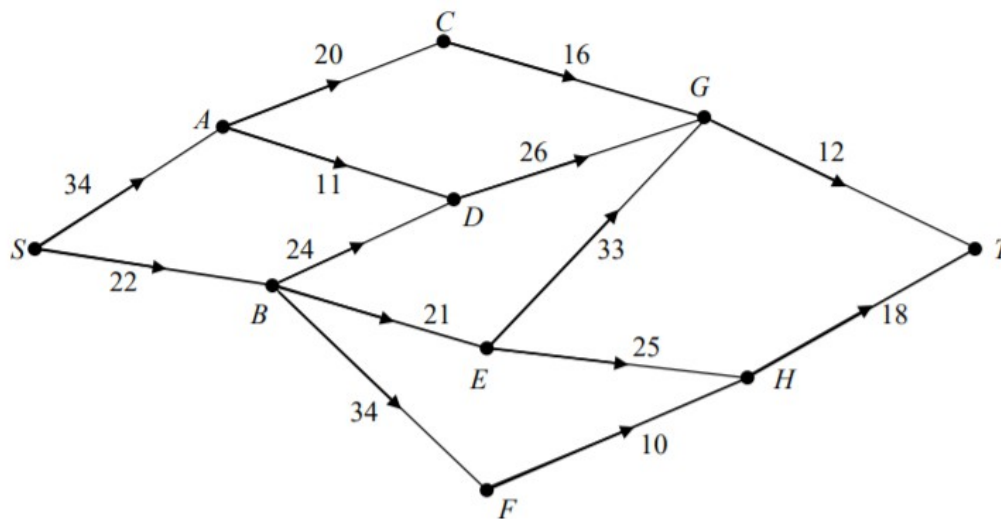
- 1 Use a Venn diagram to illustrate the relationship between the following classes of problems: P , NP , $NP\text{-hard}$ and $NP\text{-complete}$ 5 marks
- 2 a) Write down step by step instructions that will find the longest common subsequence (LCS) of two strings X and Y using the **brute force approach**. You may assume that $|X| = m$ and $|Y| = n$. Explain what would be the time complexity of determining the LCS using this approach. 6 marks

b) Write down a DP solution to find the $LCS(X, Y)$. You need to simply provide formulas/equations/relationships that finds the $LCS(X, Y)$. State the time complexity of determining $LCS(X, Y)$ using this approach. 4 marks

c) Find the LCS (X, Y) where $X = \text{“abcd a”}$ and $Y = \text{“cbadca”}$. Show all your steps including the arrows. 10 marks

3 a)

6 marks



Use Dijkstra's algorithm to find the shortest route from S to T . Show all necessary working. State the shortest route and its length.

- b) Dijkstra's algorithm uses min priority queue data structure. Explain what is the time complexity of the Dijkstra's algorithm if the priority queue is built using min heap data structure. 4 marks
- c) It is now necessary to go from S to T via H . Obtain the shortest route and its length. 2 marks
- d) Explain briefly the key idea in Bellman Ford's algorithm to solve the SSSP problem. The Bellman Ford algorithm can also determine the shortest route from S to T . With reference to time complexity, state which algorithm do you prefer to determine the shortest path from S to T . 3 marks