Department of Electrical and Computer Engineering
North South University

Midterm Examination
Fall 2020
CSE 373: Design and Analysis of Algorithms
Section 2

Time: 1 hour + 10 minutes (to upload the answer script) Total Marks 35

Instructions

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

1 Solve the following recurrence using the recursion tree method 10 marks

$T(n)=3\mathrm{T}(n/4)+cn^2, n>1$
having the base case
$T(n)=c, n=1$

2 Problems that can be solved using greedy algorithm typically exhibits two properties: (1) greedy choice property and (2) optimal substructure property. Explain what these properties are. 5 + 3 + 2 = 10 marks

In an activity selection problem, given a set of competing activities and their corresponding start and finish times, the goal is to determine the maximum number of activities that can be accommodated such that the activities are compatible with each other (i.e. there is no overlap between them). This is an optimization problem.

Frame the problem in such a way so that it becomes (1) a decision problem, and (2) a search problem.

3 Write down a pseducode called **IS-NON-LEAF(A, i)** which returns a true if the i^{th} element of a max-heap (A) is not a leaf node. If the i^{th} element is a leaf node, then it returns a false. 5 marks

4 Write down the MERGE procedure for the mergesort algorithm such that the array is to be sorted in non-increasing order. 5 + 5 = 10 marks

Both mergesort and quicksort algorithm uses the divide and conquer approach. Explain the ways these two algorithms differ.