Department of Electrical and Computer Engineering
North South University

Midterm Examination
Fall 2020
CSE 373: Design and Analysis of Algorithms
Section 1

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 recursion tree method 10 marks

$T(n) = T(n-1) + c , n > 1$
with the base case
$T(n) = c , n = 1$

2 Write down the PARTITION algorithm of the naive quicksort so that you can sort the array in descending order. Explain the advantage of randomized quicksort algorithm over the naive quicksort algorithm. 7 + 3 = 10 marks

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

4 The following is a pseudocode for solving the Tower of Hanoi problem 10 marks

```
Hanoi(n, source, dest, aux)

 if(n == 1)
    Move disk from source to destination
 else
 {
    Hanoi(n-1, source, aux, dest)
    Hanoi(1, source, dest, aux)
    Hanoi(n-1, aux, dest, source)
 }
```

Write down the recurrence relation and solve for the time complexity.