COMSATS University Islamabad, Lahore Campus

☐ **Sessional-1**   ☑ **Sessional-II**   ☐ **Terminal Examination** – **FALL 2020**

Course Title:	Design and Analysis of Algorithms		Course Code:		CSC301	Credit Hours:		3
Course Instructor/s:	Dr. Hasan Jamal		Programme Name:		BS Computer Science			
Semester:	5ᵗʰ	Batch:	FA18-BCS	Section:	A	Date:	03/12/2020	
Time Allowed:	**1 Hour and 10 minutes**			**Maximum Marks:**			**30**	
Student's Name:			Reg. No.					

Important Instructions / Guidelines:
- Make sure to write your name and registration number on all the pages. Any page without name and registration number will not be graded.
- Show all your work, as partial credits will be given. You will be graded not only on the correctness of your answer, but also on the clarity with which you express it. Please be neat.
- In case of late submission, one mark will be deducted for each minute over the submission deadline
- Any solution found to be copied would strictly result in zero marks
- **Good luck!**

Question 1:   **[Marks: 3 x 5 = 15]**

In not more than five lines each, provide the answers to the following questions. Be reasonable in your assumptions. Justify your answer.

a) You are given a list containing the birth year of all students of CUI Lahore. Your task is to determine the year in which minimum number of students were born. In terms of time complexity, what is the best way to solve this problem?

b) You have a normally distributed set of unsorted data of 10,000 numbers, within the range 18,000 to 25,000. Which algorithm will you choose to sort this data set? Justify your answer.

c) You have an unsorted list of final exam marks of a class. You would like to sort the data so that you can grade students on the curve. Which algorithm will you choose to sort this list? Justify your answer.

d) You have an unsorted list of 1,000 numbers, within the range 2,000 to 9,000. Which algorithm will you choose to sort this data set? Justify your answer.

e) You have a uniformly distributed set of unsorted data of 100,000 numbers, ranging from zero to 90,000. Which algorithm will you choose to sort this data set? Justify your answer.

Question 4:   **[Marks: 10]**

Solve the following recurrence using the "Recursion Tree Method"

$$T(n) = 4\ T\left(\frac{n}{3}\right) + n^2$$

Question 5:   **[Marks: 5]**

Solve the following recurrence using the "Master Theorem Method"

$$T(n) = T\left(\frac{2n}{3}\right) + \sqrt{n}$$