Fast**National University of Computer & Emerging Sciences, Karachi  
Fall 2018 CS-Department  
Mid Examination-001  
24th Oct 2018, 01:30 pm – 03:30 pm**

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| **Course Code: CL 201** | **Course Name: Data Structures Lab** | |
| **Instructor Name / Names: Safia Baloch, Faizan Yousuf, Maham Mobin** | | |
| **Student Roll No:** | | **Section:** |

**Instructions:**

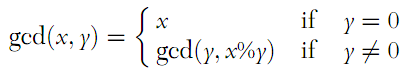
* Return the question paper.
* Read question completely before answering it.
* In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
* All the answers must be solved according to the sequence given in the question paper.

**Time: 120 minutes.** **Max Marks: 40**

**Recursion: (10)**

1. (Greatest Common Divisor) Given two integers x and y, the following recursive definition determines the greatest common divisor of x and y,

Written gcd(x,y):



Note: In this definition, % is the mod operator.

Write a recursive function, gcd, that takes as parameters two integers and returns the greatest common divisor of the numbers. Also, write a program to test your function.

**Array: (12)**

1. Design a class safeArray that solves the out-of-bound array index problem and allows the user to begin the array index starting at any integer, positive or negative. Every object of type safeArray should be an array of type int. During execution, when accessing an array component, if the index is out of bounds, the program must terminate with an appropriate error message. For example,

safeArray list(2,13);

safeArray yourList(-5,9);

In this example, list is an array of 11 components, the component type is int, and the components are list[2], list[3], ..., list[12]. Also, yourList is an array of 15 components, the component type is int, and the components are yourList[-5], yourlist[-4], ..., yourList[0], ..., yourList[8].

**Sorting: (8)**

1. Find the number of different elements in an integer array. The number of operations should be of order n2.

**Linked List: (10)**

1. Define a class linkedlist with basic functions Extend the class by adding the following operations:
   1. Find and delete the node with the smallest info in the list. (Delete only the first occurrence and traverse the list only once.)
   2. Add a function that returns the info of the kth element of the linkedlist. If no such element exists, then function show a message.