

**Shri G. S. Institute of Technology and Science**  
**Department Of Computer Engineering**  
**CO3463: Design and Analysis of Algorithms**  
**Lab Assignment # 01**  
Marks: 10 points

Submission Date: 22 January 2017@23:59

Demo Date: 23 January 2017 - 27 January 2017

**Late Submission:** Not allowed

**No copying allowed.** If found then students involved in copying will fail in this course.

**Note: For the each program, draw a graph between the size of inputs and computational time required by yours program.**

- Q. 1. Write a program to generate the n unique random numbers by two different algorithms.
- Q. 2. There is an array A of integers of size n which cannot directly be accessed. However, you can get true or false response to queries of the form  $A[i] < A[j]$ . It is given that A has only one duplicate pair, and rest all the elements are distinct. So it has n-1 distinct elements and 1 element which is same as one of the n-1 elements. Your task is to identify the indices of the two identical elements in A.
- Q. 3. Write a function **customSort** takes a "num" array of integers as an input along with the array of "weights" which contains the weights of the corresponding integers. We wish to sort this vector "num" from the indices **start** to **end** based on the fact that numbers with higher weights appear first and in case the weights are equal, we put the greater number first in the list. We also wish efficient algorithms. We expect an  $O(n \cdot \log(n))$  algorithm here instead of a  $O(n^2)$  one.
- Q. 4. Write a program to find the value of  $x^n$ , where 'x' and 'n' are the real numbers using 3 different algorithms.
- Q. 5. Write a program to find the factorial of the given number ( $0 < n < 10,000,000,000$ ).
- Q. 6. Write a program to find the  $n^{\text{th}}$  Fibonacci number with two different approach and compare their time complexity.
- Q. 7. An array of integers is said to be a *straight-K*, if it contains K elements that are K consecutive numbers. For example, the array {6, 1, 9, 5, 7, 15, 8} is a straight because it contains 5, 6, 7, 8, and 9 for K=5. Write a program to finds the maximum value of K for the given number of integers.
- Q. 8. You have an array like :-{ 5,5,5,13,6,13,6,7,8,7,-1} Write and analyze an algorithm to arrange this array in sorted form based upon the number of occurrence e.g.: above should look like this after execution of your also {5,5,5,13,13,6,6,7,7,8,-1} 13 comes before 6 because it has same number of occurrence as 6 but it come first in the parent array.
- Q. 9. Write a program to find the determinant of the given matrix of size NxN using recursion.
- Q. 10. Write a program to display the elements of given matrix of size NxN in clockwise spiral order using recursion.