MANIPAL UNIVERSITY
International Centre for Applied Sciences
III Semester, BS Engg.
Data structures
Assignment I

1. What is a template? Give the function template for sorting a list of n values and instantiate this template for integers and floating-point values.
2. Write a function template for finding the second largest element in the given list of n elements and instantiate this template for int and float types.
3. Write an algorithm for evaluation of prefix expression using stack.
4. Evaluate the prefix expression, -*+ABCD, with the values A=4, B=3, C=2, d=5 using the above algorithm. Show the symbol scanned, opr1, opr2, result and opndStack contents in each scan in the form of table.
5. Give the algorithm for converting an Infix expression to Postfix.
6. Convert the infix expression **((a+b)*c-(d-e))^(f+g)** to postfix using stack. Show the **symbol** scanned, **postfix string** and **operStack** contents in each scan in the form of table.
7. Give the algorithm/function (in C++) for inserting an item into a Circular Queue.
8. Give the algorithm for evaluation of Postfix Expression using Stack.
9. Evaluate the postfix form of infix expression given in the question 3 with the values a=1,b=2, c=3, d=4, e=5, f=6 and g=7. Show the **symbol** scanned, **opr1, opr2 result** and **pndStack** contents in each scan in the form of table.
10. Discuss the problems associated with linear queue with suitable diagrams.
11. What is Big oh notation? Prove that run time, $f(n) = n^3 + 20n + 1$ is $O(n^3)$ by finding the values of c & n_0.
12. How is performance of an algorithm measured? Explain with proper examples.
13. What is Recursion? Give the properties of Recursive Algorithm. Also, list the advantages and disadvantages of using Recursion.
14. Write a recursive function to find whether a given string is palindrome or not. Show how the function is called in main().
15. Write a recursive function to compute **Fibonacci** of a given number. Show the working of this function for the call Fibonacci(5) by showing various calls to **Fibonacci**.

16. What is a Stack? Write a class template with all necessary operations on stack.
17. Give the recursive function for Tower of Hanoi Problem. Show the working of this function when no. of disks=5.
18. Implement two stacks using a single linear array. Give all the necessary functions.
19. What is meant by a priority queue? Give its types along with an example for each. Explain with necessary algorithms, how you implement a priority queue mentioning the problems associated with each type of implementation.
20. **The Bashemin Parking Garage contains a single lane that holds up to ten cars. There is only a single entrance/exit to the garage at one end of the lane. If a customer arrives to pick up a car that is not nearest the exit, all cars blocking its path are moved out, the customer's car is driven out, and the other cars are restored in the same order that they were in originally.**

    Write a program that processes a group of input lines. Each input line contains an 'A' for arrival or a 'D' for departure, and a license plate number. Cars are assumed to arrive and depart in the order specified by the input. The program should print a message whenever a car arrives or departs. When a car arrives, the message should specify whether or not there is room for the car in the garage. If there is no room, the car leaves without entering the garage. When a car departs, the message should include the number of times that the car was moved out of the garage to allow other cars to depart.