Assignment-1

Data Structure CS-123

1. What is a linear queue? Implement a linear queue with constructor, destructor, insert, deletion

and display along with isFull and isEmpty methods. Show the method invocation in main().

1. Write an algorithm to evaluate the prefix expression using stack. Also apply your algorithm to

evaluate the prefix expression + - 9 2 7 \* 8 / 4 12.

1. What is a Recursion? Give the properties of Recursive Algorithm. Also, list the advantages and disadvantages of using Recursion.
2. Write an algorithm to convert an infix expression to postfix notation and trace that algorithm

to convert the following infix expression to postfix expression.

A - (B / C + (D % E \* F) / G)\* H

1. What is an algorithm ? Explain how you analyze the performance of an algorithm with an example.
2. Discuss the problems associated with linear queue with suitable diagram. Give the algorithm/function( in C++) for inserting an item into a Circular queue.
3. When there are number of vehicles queued on a Highway during a traffic jam, certain vehicles are given priority over other to give way. The possible type of vehicles on road are listed below. When a vehicle arrives , vehicle priority( an integer) is read and inserted into the traffic queue in the order of arrival . When the traffic is to be cleared, a vehicle with highest priority is allowed to move first and the vehicles following it in the queue move forward by one position. Write a program to simulate the above situation using suitable data structure.

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| **Vehicle Type** | **Priority** |
| Emergency | 10 |
| Fire | 9 |
| School | 8 |
| CM | 7 |
| Other | 6 |

1. What are class template? Write a template class for implementing Stack with push( ), pop( ) , IsEmpty( ) and isFull( ) member functions. Show the instantiation of Stack class for integer and float types. Use dynamic memory allocation and de-allocation.
2. What is Big oh notation.
3. Show the steps to solve tower of Hanoi with 3 disks .
4. Define Stack data structure and discuss its application related to recursion.
5. Derive the average case time complexity in finding the factorial of a number.
6. List four general applications of queue as a data structure.
7. Write algorithm for binary search technique. Express its average case time complexity in Big Oh notation.
8. When and how will you express the time complexity of a given algorithm? Explain.
9. What is priority queue? What are the ways to implement it?
10. Write an algorithm to convert infix expression to prefix expression.
11. Write program to demonstrate multiple Stack.