JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Mid Term II Examination, October 2024
B.Tech, Semester III, 2024-25

Roll No. 2023BTECH018

CS1131: Data Structure and Algorithms Time: 1.5 hours Max. Marks: 20

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

Q.1

a) What is the complexity of the following? **Show the steps.**

1.
```
void foo(int n) {
    for (int i = n/2; i < n; i=i*2)
        printf("%d\n",i);
    for (int i = n/2; i < n; i++)
        for (int j = 1; j < i; j++)
            printf("%d\n",i);
}
```

2.
```
void foo(int n) {
    for (int i = 2; i <= n; i= pow(i,c) )
        printf("%d\n",i);

}
```

b) Convert the **Infix** expression ((A+B)^B+A)-C+A^B to **Prefix** using a stack. Show the changes in the stack. Do not write the program.

c) Consider an array of size 5with a starting index 0 and N-1 = 4. A circular queue is implemented on this array. After some operations, the queue has 3 elements 10, 20 and 40 with F=2 and R=4. Perform the following operations, if possible: (a) Enqueue 50 and 60 (b) Enqueue 30 (c) Delete 2 elements from the queue. Show the sequence of steps with necessary diagrams with the value of F & R.

d) What will be the complexity of updating the marks of i^{th} student if marks are stored in:

a. an unsorted array of size n
b. a sorted array of size n
c. a singly linked list of size n
d. a circular linked list of size n

(3+2+2+2) *(LO 1,2,3,4)*

Q.2 You have to merge two sorted single linked lists and store the result in a third single linked list. For this, write a **function** called **merge** that takes the two linked list as arguments and (3) *(LO1,2)*

	returns the merged linked list. Remember, every node of the linked list is self-referential with integers. Create such a struct and use this struct in the function merge. Your program should handle all test cases. Note: The merged linked list must be sorted.	
Q.3	**Write a program** to remove consecutive duplicate words in a sentence. For example, consider the sentence *I can can do this*. The correct sentence is *I can do this* with the duplicate *can* removed. Use a **stack** for this. *Note: You can use string.h for this program. Stack may be implemented using either array or linked list.*	(4) *(LO 1, 2, 3)*
Q.4	Consider the front of the emergency of a hospital. A patient with higher rating will be serviced first even though patients with lower rating are waiting in the queue. Write the **enqueue function** where the patients are always arranged according to their **rating** in the order of **highest to lowest. Write the structs that you will use in the function.** Your code should execute in no more than O(n) complexity. Your function should handle all the test cases.	(3) *(LO 1,2, 3)*
~~Q.5~~	Consider the following list: 7, 2, 4, 6, 1, 3, 5 Sort the list by performing **Insertion Sort OR Bubble Sort.** Show every step of the process	(1) *(LO 5)*