INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DHARWAD
KARNATAKA – 580009

Degree: B.Tech **Semester: II**

Course Code & Title: CS102 – Data Structures

Time: 90 Min **Maximum Marks: 50**

Mid Semester Examination: June - 2021

Part – A (2*5 = 10 marks)

Answer all the following questions:

1. Rank the following functions by order of growth:
   $(n+1)!$, $n!$, 4^n, $n \times 3^n$, $3^n + n^2 + 20n$, $n^2 + 200$, $20n + 500$, $2^{\lg n}$, $n^{2/3}$, 1.

2. Discuss postfix evaluation using stacks with suitable example?

3. How to implement a queue using stacks?

4. How to efficiently implement stack using queues?

5. Given an integer *k* and a queue of integers, how do you reverse the order of the first *k* elements of the queue, leaving the other elements in the same relative order? For example, if k=4 and queue has the elements [10, 20, 30, 40, 50, 60, 70, 80, 90]; the output should be [40, 30, 20, 10, 50, 60, 70, 80, 90].

Part – B (10*4 = 40 marks)

6. A. Discuss with suitable example how stacks can be used for checking balancing of symbols.
   B. Discuss infix to postfix conversion algorithm using stack with suitable example.

7. Given a circular queue of integers, rearrange the elements by interleaving the first half of the list with the second half of the list. For example, suppose a queue stores the following sequence of values: [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]. Consider the two halves of this list: first half: [11, 12, 13, 14, 15] second half: [16, 17, 18, 19, 20]. These are combined in an alternating fashion to form a sequence of interleave pairs: the first values from each half (11 and 16), then the second values from each half (12 and 17), then the third values from each half (13 and 18), and so on. In each pair, the value from the first half

appears before the value from the second half. Thus, after the call, the queue stores the following values: [11, 16, 12, 17, 13, 18, 14, 19, 15, 20].

8. A. How will you check if the linked list is palindrome or not?
B. Given a linked list, how do you modify it such that all the even numbers appear before all the odd numbers in the modified linked list?

9. A. Solve the following recurrence relation

$$T(n) = \begin{cases} 1 & , \text{ if } n = 1 \\ T(n-1)+n(n-1), & \text{if } n \geq 2 \end{cases}$$

B. What is the running time of the following recursive function? First write the recurrence formula and then find its complexity.

```
function(int n){
    if(n<=1)
        return;
    for(int i=1;i<=3;i++){
        function(n/3);
    }

}
```