

Semester III (B.Tech)

Er. No. 2013178  
Academic Year: 2023-24**Jaypee University of Engineering & Technology, Guna**

T-2(Odd Semester 2023)

18B11CI311 – Data Structures

Maximum Duration: 1 Hour 30 minutes

Maximum Marks: 25

**Notes:**

1. This question paper has **five** questions.
2. Write relevant answers only.
3. Write the questions in a serial order.
4. Do not write anything on question paper (Except your Er. No.).

**Marks CO No.****[05] CO5**

**Q1.** Design a time-efficient algorithm to delete the Nth node from the end of the given singly linked list. Assume that the linked list is implemented using only a START pointer. Ensure that your algorithm does not require scanning the linked list more than once.

**Examples:****Input:**  $2 \rightarrow 3 \rightarrow 1 \rightarrow 7 \rightarrow \text{NULL}$ ,  $N = 1$ **Output:** The linked list after deletion is:  $2 \rightarrow 3 \rightarrow 1 \rightarrow \text{NULL}$ **Input:**  $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow \text{NULL}$ ,  $N = 4$ **Output:** The linked list after deletion is:  $2 \rightarrow 3 \rightarrow 4 \rightarrow \text{NULL}$ **Input:**  $7 \rightarrow 9 \rightarrow 5 \rightarrow 4 \rightarrow 3 \rightarrow 8 \rightarrow 1 \rightarrow \text{NULL}$ ,  $N = 6$ **Output:** The linked list after deletion is:  $7 \rightarrow 5 \rightarrow 4 \rightarrow 3 \rightarrow 8 \rightarrow 1 \rightarrow \text{NULL}$ **Input:**  $1 \rightarrow \text{NULL}$ ,  $N = 1$ **Output:** The linked list after deletion is: (empty linked list)**Input:**  $3 \rightarrow 1 \rightarrow 4 \rightarrow \text{NULL}$ ,  $N = 5$ **Output:** Invalid input: N is greater than the length of the linked list.**[05] CO3**

**Q2.** Consider a doubly linked list in which START and END are pointers to the first and last nodes, respectively. Write an algorithm to insert a new node at a specified location in the doubly linked list. Illustrate the main steps of the algorithm with suitable diagrams.

- Q3. Write down five differences between array and linked list data structures, [05] CO4  
and provide suitable examples for each difference.
- Q4. Write down the merge sort algorithm with its time complexity in the best [05] CO2  
and worst case.
- Q5. Write the steps to convert an infix expression into a postfix expression. [05] CO3  
Apply the steps to convert the following infix expression into postfix  
using a stack:

$$(A + (B * C ^ ((D / E) / F) / G) - H)$$

**Note:** The operator ^ represents the exponentiation operation.