

# **Purnea College of Engineering, Purnea**

## **Data structure and algorithms**

### **Class Assignment No. 1**

1. Explain the concept of time-space trade off with a suitable example and discuss its significance in algorithm design.
2. Describe the typical operations of a data structure (insertion, deletion, traversal) and provide algorithmic steps for each using array.
3. Illustrate the step-by-step execution of binary search on a sorted list of 10 elements. Calculate its time complexity.
4. Explain how stacks can be used for expression evaluation and parenthesis matching. Provide a worked-out example.
5. Write pseudocode for inserting a node after a given node in a singly linked list. Analyze the time complexity.
6. Explain how doubly linked lists provide better traversal flexibility. Provide algorithms for insertion and deletion operations.
7. Evaluate the postfix expression  $5\ 3\ +\ 8\ 2\ -\ *$  using a stack. Show stack status after each step and final result.
8. Simulate a circular queue of size 5 and perform the following operations: Enqueue(10), Enqueue(20), Enqueue(30), Dequeue(), Enqueue(40), Enqueue(50), Enqueue(60). Show the queue after each operation.
9. A priority queue stores patient records in a hospital. Patients with lower numbers have higher priority. Given the input sequence: (4, Alice), (2, Bob), (5, Carol), (1, Dave), insert each using a heap-based priority queue and show the heap after each insertion.
10. Given a doubly linked list with elements  $10 \leftrightarrow 20 \leftrightarrow 30 \leftrightarrow 40$ , delete node 30 and show the updated pointer structure. Write pseudocode for the operation.
11. Implement a stack using a singly linked list. Simulate the operations: Push(5), Push(10), Pop(), Push(15), Pop(), Pop(). Show the stack at each step.