Sessional I, October 2024

B.Tech CE31- III Semester

Data Structures and Algorithm

Instructions: *It is compulsory to answer all the questions (2 marks each) of Part A in short and (5 marks each) from Part B in detail.*

Max. Marks. 30   **Time Duration: 90 min**

Part A

1. a) Define Abstract Data Types.

    b) List the merits and demerits of Array over Linked list.

    c) What is the time complexity of the following recursive function?

    int func(int n) {

    if (n <= 1) return 1;

    return func(n - 1) + func(n - 1); }

    d) How does a stack handle underflow and overflow conditions?

    e) Given that $f(n)=2^n$ and $g(n)=n^3$, determine which function has a higher growth rate asymptotically.?

Part B

2. Write an algorithm to Check for Majority Element in a sorted array .Given an array arr of N elements. A majority element in an array arr of size N is an element that appears more than N/2 times in the array. The task is to write a function say isMajority() that takes an array (arr[]), array's size (n) and a number to be searched (x) as parameters and returns true if x is a majority element (present more than n/2 times).

3. Suppose an ITEM is to be inserted into a sorted linked LIST. The ITEM must be inserted between the nodes A and B such that INFO(A) < ITEM ≤ INFO(B). Write an algorithm to find the appropriate location for ITEM and insert it in the LIST.

4. a. Consider the following infix expression Q: ((A + B) * D) ↑ (E - F).
    Translate Q into its equivalent postfix expression P.

    b. Write an algorithm to implement a stack using an array. Implement the operations for **push**, and **pop**. Explain the time complexity of each operation.

5. Write an algorithm to implement selection sort. Also discuss its best case, worst case and average case complexity.
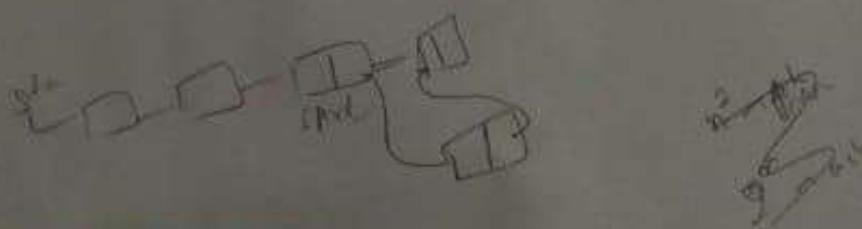
J.C. BOSE UNIVERSITY OF SCIENCE AND TECHNOLOGY, YMCA, FARIDABAD.
FIRST SESSIONAL_OCT 2024

SUBJECT: DATA STRUCTURE
M.M:30
SEM: 3rd B.Tech (CE 32)
PAPER: PCC-CS-301

Q1. What do you mean by Data Structure? Explain the types of data structure. (2) CO1

Q2. Explain Linear Search and binary search technique and compare complexity of both the techniques. (5) CO2

Q3. Explain the following:
   (a) Push operation in stack
   (b) Merge Sort (10) C

Q4. What do you mean by time complexity of an algorithm? What is Big O notation? (3) CO1

Q5. What is circular queue? What are its applications? Explain the underflow and overflow conditions in circular queue. (5) CO2

Q6. Write a program for deletion of a linklist element from a specific position. (5) CO2