INSTITUTE OF ENGINEERING & TECHNOLOGY LUCKNOW (UP)

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

B.Tech. (Electronics and Communication Engineering)

(SEM III) Odd Semester 2024-25

Class Test-1

Subject: Basics Of Data Structure & Algorithm **Subject Code: IOE036**

Max. Marks: 20 **Time: 1 hr.**

Attempt all questions. **[5x4=20]**

Q.1 Define Data structure. Why do we need data structures? How data structures are classified? [4]

Q.2 How you can find the complexity of an algorithm? What is the relation between the time and space complexities of an algorithm? [4]

Q.3 Each element of an array Arr1 [20][50] requires 4 bytes of storage. Base address is Data is 2000. Determine the location of Arr1 [10][10], when the array is sorted as: [4]

a) Row Major

b) Column Major

Q.4 Differentiate between Array and Linked List. Explain the various operations of the Linked List ADT with examples. [4]

Q.5 Write a program for array implementation of lists.

OR [4]

Mention the steps involved in insertion and deletion into singly linked list.

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Class Test-2

Subject: Basics Of Data Structure & Algorithm **Subject Code: 1OE036**

Max. Marks: 20 **Time: 1 hr.**

Attempt all questions. Make sure your answers are legible and accurate. **[4x5=20]**

Q.1 Perform and represent **multiplication** on given polynomial. **[5]**

a)
- P1: $3x^3 + 6x^1 - 9$
- P2: $9x^3 - 8x^2 + 7x^1 + 2$

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b)
- P1: $6x^4 + 10x^2 + 5$
- P2: $4x^3 - 7x^2 + 2x + 1$

Q.2 Convert the given infix expression into **postfix** and **prefix** notation: **[5]**

a) A + B * C - D / E + F * G

b) (P + Q) * R - S / (T + U) * V

Q.3 Distinguish between iteration and recursion. Write a recursive and non-recursive program to print the Fibonacci series. *(Fibonacci series: 0 1 1 2 3 5 8 13 21 34)* **[5]**

Q.4 Write an algorithm to add an element in the queue (enqueue operation). Describe the various operations carried out on the priority queue. **[5]**

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Subject Code: IOE-036	Roll No.:

B.Tech.
(SEM III) ODD SEMESTER EXAMINATION 2024-25
BASICS OF DATA STRUCTURE & ALGORITHM

[TIME: 3 hrs.] **[Max. Marks: 70]**

Note: *Attempt All Questions. All Question carry equal marks.*

Q1. Answer **ALL** parts. Marks

(a) Differentiate between linear and non-linear data structures with examples 3.5

(b) Why do we need an asymptotic notation? Explain the different asymptotic notations. 3.5

(c) Each element of an array Arr1 [20][40] requires 4 bytes of storage. Base address is 2000. Determine the location of Arr1 [10][10], when the array is sorted as:
(i) Row Major
(ii)Column Major 3.5

OR

Describe the representation of single-variable polynomial P(x) = 4x^3 + 3x^2 - 7 using arrays.

(d) Explain the difference between singly linked lists and doubly linked lists with a suitable example. 3.5

OR

Write the procedure to insert an item at the beginning and at the end of a linked list.

Q2. Answer **ALL** parts.

(a) Write an algorithm to implement a stack using an array. Your algorithm has to address the underflow and overflow conditions. 7

OR

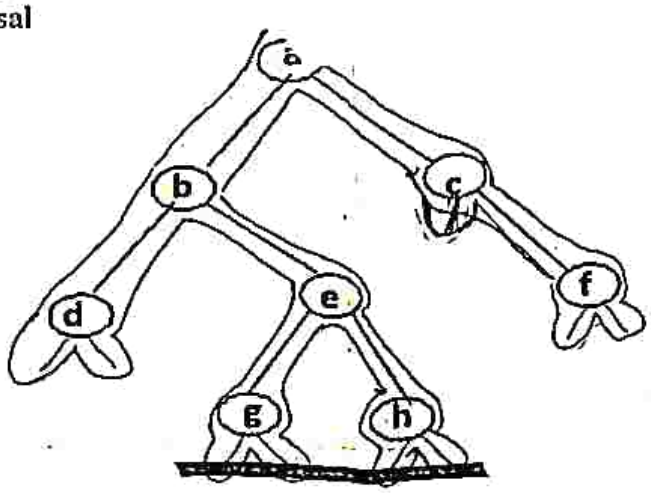
Convert the given infix expression into postfix expression using stack:

E= P + (Q * R – (S / T ^ U) * V) * W

(b) Explain the concept of circular queue. How does it address the problem of wasted space in a regular queue when implemented using arrays? 7

Q3. Answer **ALL** parts.

(a) Write iterative procedure of the following binary tree traversals and test on the given binary tree:
(i) Inorder traversal
(ii) Preorder traversal
(iii) Postorder traversal



7

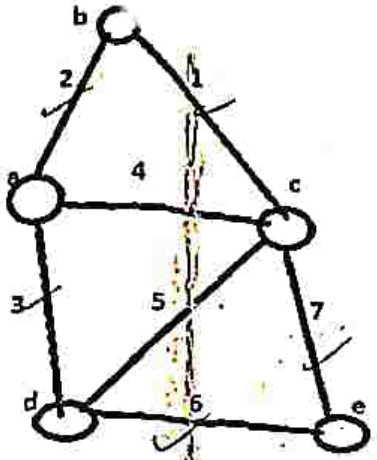
(b) Define binary search tree. Make a binary search tree by inserting the following sequence in inorder into an empty binary search tree:
9, 8, 16, 27, 24, 7, 6, 2, 15, 22, 12,

OR

Define the following terms:
(i) Strictly binary tree
(ii) Complete binary tree
(iii) Extended binary tree

Q4. Answer ALL parts.

(a) Define the spanning tree of a graph. Find the minimum cost spanning tree of the following graph using Prim's Algorithm. 7



(b) Differentiate between Breadth First Search (BFS) and Depth First Search (DFS) of a graph with suitable example. 7

OR

Explain adjacency matrix and adjacency list representations of a graph.

Q5. Answer ALL parts.

(a) Write the binary search algorithm. Test your algorithm on the following array, to find the key value 9. 7
Array: [3, 5, 7, 9, 11, 13, 17]

(b) Give trace of steps to sort following array using quick sort algorithm: 7
Array: [17, 25, 32, 11, 15, 65, 2, 5, 9, 55]

OR

Explain the process of inserting and searching for elements in a hash table using a hash function.