# **INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous) Dundigal, Hyderabad - 500 043

B.Tech III SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - FEBRUARY 2023 **Regulation: UG20** 

DATA STRUCTURES

Time: 3 Hours

COMMON TO ALL BRANCHES

Max Marks: 70

Course Code: ACSC08

Answer ALL questions in Module I and II Answer ONE out of two questions in Modules III, IV and V **All Questions Carry Equal Marks** All parts of the question must be answered in one place only

## MODULE-I

- 1. (a) State the properties of an algorithm. Explain the quick sort algorithm with an example and write the time complexities. [BL: Understand] CO: 1|Marks: 7]
  - (b) Consider a given list of integers 10, 18, 19, 20, 25, 28, 48, 55, 62, 70 and describe the steps to implement the binary search method. Write a Python program to find the desired element 25 in the given list using binary search. [BL: Apply] CO: 1|Marks: 7]

## MODULE - II

- 2. (a) List out the applications of stack. Write a Python program for i) Push ii) Pop iii) Display operations using the same definition. [BL: Understand] CO: 2|Marks: 7]
  - (b) Write a program for reversing a linear queue Q. The following standard operations are allowed on queue.

enqueue(x): Add an item x to rear of queue.

dequeue(x) : Remove an item x from front of queue. empty() : Checks if a queue is empty or not.

[BL: Apply] CO: 2|Marks: 7]

# **MODULE** – III

3. (a) Differentiate between creation of singly linked list node and double linked list node. Implement double ended queue (DEQUE) using circular doubly linked list.

[BL: Understand] CO: 3 [Marks: 7]

[BL: Apply] CO: 4|Marks: 7]

- (b) Develop a GetNth() function that takes a linked list, an integer index and returns the data value stored in the node at that index position. Example: Input: 1 > 10 > 30 > 14, index = 2 The node at index 2 is 30. [BL: Apply] CO: 3 Marks: 7]
- 4. (a) Write a function to implement circular singly linked list operations. i) Insert a node at beginning ii) Delete a node at end [BL: Understand] CO: 4|Marks: 7]
  - (b) Convert the following infix expression into postfix expression a + b \* c - (d / e + f \* g \* h)

#### $\mathbf{MODULE}-\mathbf{IV}$

- 5. (a) Explain spanning tree and minimum spanning tree. Write pseudocode to find minimum spanning tree using Kruskal's algorithm with example. [BL: Understand] CO: 5|Marks: 7]
  - (b) Write recurssive algorithms for the given tree in Figure 1 and givei) Inorder traversal ii) Preorder traversal iii) Postorder traversal

[BL: Apply] CO: 5|Marks: 7]



Figure 1

- 6. (a) Outline the following with example i) Strictly binary tree ii) Skewed binary tree iii) Complete binary tree [BL: Understand | CO: 5|Marks: 7]
  - (b) Give the depth first traversal (DFS) for the following graph given in Figure 2.

[BL: Apply| CO: 5|Marks: 7]



Figure 2

### $\mathbf{MODULE} - \mathbf{V}$

- 7. (a) Mention the properties of binary search tree (BST). Discuss the AVL tree rotaion techniques with example. [BL: Understand| CO: 6|Marks: 7]
  - (b) A phone book is stored in a text file, containing names of people, their city names and phone numbers. Write a Python program by choosing an appropriate data structure to search a person's phone number based on his/her first name and city.
    (BL: Apply| CO: 6|Marks: 7]
- 8. (a) Summarize about hashing. Describe the collision resolution techniques separate chaining and open addressing with suitable examples. [BL: Understand] CO: 6[Marks: 7]
  - (b) Consider a hash function as "key mod 7" and sequence of keys as 50, 700, 76, 85, 92, 73, 101 using separate chaining. Also write the advantages of separate chaining.

[BL: Apply] CO: 6|Marks: 7]

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