INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500043
B.Tech III SEMESTER END EXAMINATIONS (REGULAR / SUPPLEMENTARY) - FEBRUARY 2023

Regulation: UG20
DATA STRUCTURES
Time: 3 Hours
COMMON TO ALL BRANCHES
Max Marks: 70

Answer ALL questions in Module I and II<br>Answer ONE out of two questions in Modules III, IV and V<br>All Questions Carry Equal Marks<br>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: $2 \mid$ Marks: 7$]$
(b) Write a program for reversing a linear queue Q. The following standard operations are allowed on queue.
enqueue $(\mathrm{x})$ : 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]
(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
$\mathrm{a}+\mathrm{b} * \mathrm{c}-\left(\mathrm{d} / \mathrm{e}+\mathrm{f}^{*} \mathrm{~g} * \mathrm{~h}\right)$
[BL: Apply| CO: 4|Marks: 7]

## MODULE - 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 give
i) 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

## MODULE - 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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