

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: B.Tech

Sub_Code: RAE4G003/RAU4G003/REC4G002/ RME4G003/
RMF4G003/RMM4G003/RMN4G003/RPL4G003

4th Semester Back Examination: 2024-25

SUBJECT: Data Structure

BRANCH(S): AME, AUTO, ECE, ETC, MECH, MANUTECH, METTA, MME, MINING, PLASTIC

Time: 3 Hours

Max Marks: 100

Q.Code: S232

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

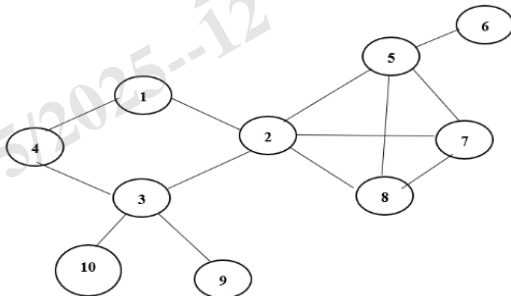
Q1 Answer the following questions: (2 x 10)

- How many stacks are required to implement Queue?
- Write the condition to test "Queue is Empty and "Queue is full".
- Compute the postfix equivalent of the following expression: $3 * \log(x + 1) - a/2$.
- Define a complete binary tree and strictly binary tree with suitable example.
- Which data structure are applied when dealing with a recursive function.
- Show that for any non-empty binary tree, if T_0 is the number of Leaf nodes and T_2 is the number of full nodes, then $T_0 = T_2 + 1$.
- The preorder traversal of a binary search tree T is: $\langle 40, 20, 10, 30, 60, 50, \text{ and } 70 \rangle$. Convert it into the inorder traversals of T.
- Illustrate the representation of doubly linked list. Give an example of double linked list with 4 nodes.
- Classify the hashing function based on the various methods by which key value is found
- Explain about threaded binary tree with an example.

Part-II

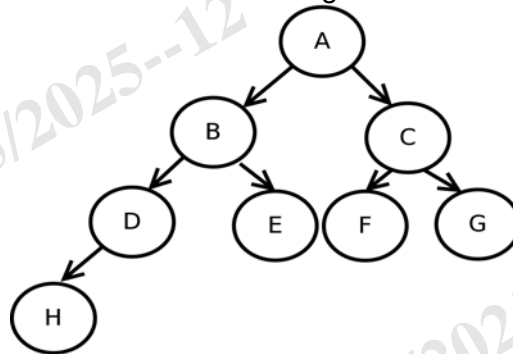
Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Construct the spanning tree using the Breadth First Search for the following graph, starting from node 1



- Differentiated between array and linked list.
- Write a Program to reverse a String using Stack.
- Differentiate Binary tree and B-Tree. Construct a B-Tree of order 4 from the given list of elements:
12, 75, 60, 20, 115, 42, 85, 138, 100, 55, 185, 99, 168, 240, 30

- e) Discuss the advantage and average efficiency of quick sort? Apply Quick sort on the following data and show the contents of the array every pass:
48, 7, 26, 4, 13, 23, 98, 57, 10, 5, 32
- f) Convert the following list of keys into a Max heap and sort them using the Heap Sort technique.
 8, 20, 9, 4, 15, 10, 7, 22, 3, 12
- g) Write function for push, pop operation on the stack and add and delete functions on the queue.
- h) Differentiated between linear and nonlinear data structure. List out few application of data structure.
- i) Let A is the array of the following elements **A = {2, 4, 6, 8, 9, 10, 12, and 13}**. Search the element **12** using binary search technique. Write its time complexity.
- j) Write the recursive procedure for different tree traversal techniques and perform the preorder, in order and post order traversal for the following tree:



- k) Define a Sparse Matrix. Specify an Efficient Representation of Sparse Matrix.
- l) Write a program to arrange the list of numbers in ascending order using bubble sort

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3** a) Write a Program to perform insertion and Deletion from a Linear Array. (8 x 2)
 b) Write a Program to Search an Element in a List using Binary Search Technique. Specify the Time Complexity of Binary Search. If a List has 2048 Elements, compute the number of comparisons required in Linear Search and Binary Search.
- Q4** a) Convert the expression $((A + B) - C) / (D - E) * (F + G)$ to equivalent Postfix notations using a Stack. (8 x 2)
 b) Describe the Algorithm for the Evaluation of Postfix Expression. Apply the postfix evaluation algorithm to evaluate the expression $1\ 5\ 7\ 3\ -\ 2\ ^\ * +$
- Q5** a) Describe the different collision resolution techniques. Apply chaining and linear probing to store the following values in a hash table of size 7:
 25, 42, 96, 101, 102, 162, 197 (8 x 2)
 b) Arrange the following values in ascending order using insertion sort and selection sort.
 23, 11, 37, 28, 15, 19, 55, 9
- Q6** a) Write an algorithm/program to perform the following operations in a Doubly linked list: (8 x 2)
 i) To delete the last node.
 ii) To insert a node after a given node.
 b) Insert the following nodes in an AVL tree.
 21, 26, 30, 9, 4, 14, 28, 18, 15, 10, 2, 3