Data Structures and Algorithms			
Subject Code:	**18CSI301**	**Total Hours:**	**45**
Credits :	**03**	**Hours per week:**	**03**

QUESTION BANK

UNIT-III Linked List

1. What is a linked list? Explain the different types of linked list with diagrammatic representation.

2. List the differences between singly linked list and doubly linked list.

3. Write the advantages and disadvantages of linked list over arrays.

4. List out the advantages and disadvantages of singly linked list, double linked list and circular singly linked list.

5. Write C function to perform the following operations using singly linked list, doubly linked list and circular linked list:

a. Insert a node in the beginning of the list.

b. Insert a node in the end of the list.

c. Delete the first node from the list

d. Delete the last node from the list.

e. Insert the node based on the position.

f. Delete the node based on the position.

g. Search for key node in the list.

h. Traverse list from left to right.

i. Traverse list from right to left in a doubly linked list.

6. What is doubly linked list? Explain the insertion and deletion operation based on the position in a doubly linked list with its pictorial representation.

7. Write a C program to perform insert at specified position for a doubly linked list. Explain the same with neat diagram.

8. Write a C program to perform delete at specified position for a doubly linked list. Explain the same with neat diagram.

9. Assume that a college maintains a general linear list that holds information about the students and that each data element is a record with three fields: ID, Name and Grade. Write an Algorithm or Program that helps a professor to change the grade for a student. The delete operation removes an element from the list, but makes it available to the program to allow the grade to be changed. The insert operation inserts

the changed element back into the list. The element holds the whole record for the student, and the target is the ID used to search the list.

10. A doctor wants to maintain the records of the patient treatment for future usage. Doctor gives the requirements to an ABC company for design and development. Based on the requirement and detailed analysis, Team has decided to use linked list to implement the software module. Being the member of the team, you have been identified and assigned to implement the following using C and later the same shall be integrated with others modules to build the final system. Address the following queries:

i. justify the selection of type of linked list for implementation.
ii. identify the key data field for the various operation.

Patient information(Node): Name, contact, treatment, gender, age details

The following operation need to be considered:

i. getnode()
ii. Insertion of new node in an ordered fashion into the list.
iii. Searching for patient data.

11. Illustrate applications of linked lists with suitable examples: Polynomials and Sparse matrix representation.

12. Implement Stacks using linked lists.

13. Implement Queues using linked lists.

14. Implement Double Ended Queue using linked lists.

UNIT IV: TREES

1.What is binary tree? Mention the applications of tree.

2.Discuss Properties of Binary trees, explain the memory representation (Array and linked representation) of Binary Trees.

3. Write a C program to implement Binary Search Tree using List.

4. Write a C program to create a Binary Search tree and traverse it using pre-order, in-order and post order.

5. Write a C program to search a node in BST.

6. Define the following tree terminologies:

1) Root node 2) Edge 3) Siblings 4) Leaf node 5) Degree of a node 6**)** Height of a node 7) Path 8) Ancestors of a node 9) Descendants of a node 10) Depth of tree 11) Level of tree.

7. With a neat diagram, explain complete binary tree and almost complete binary tree.

8. Explain the concept of tree. Mention the application of trees.

9. Create a binary search tree using the following data elements:

a. 45,39,56,12,34,78,32,10,89,54,67,81

b. 56,78,99,34,56,76,89,12,56,78,63

c. 12,45,34,23,76,45,89,87,66,75,35

10. Explain the array based and linked based representation of binary tree with suitable example.

11. Write short notes on:

a. complete binary tree **b**. Binary search tree **c**. Terminal and non-terminal nodes.

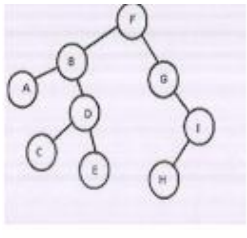
12. What is binary search tree? Write program to create a binary search tree with the functions to find the largest element in a tree and smallest element in a tree.

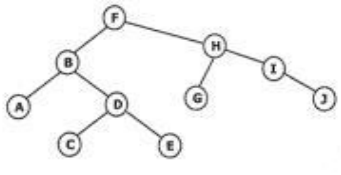
13. Write an algorithm or program to search for a given element in the BST.

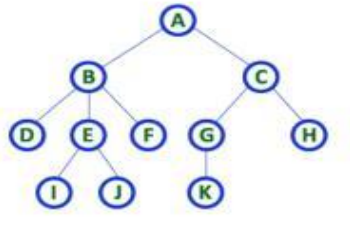
14. Write an algorithm or program to insert a given element to the BST.

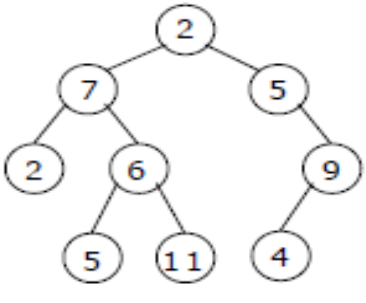
15. Write an algorithm or program to delete a given element from the BST (consider all the three cases).

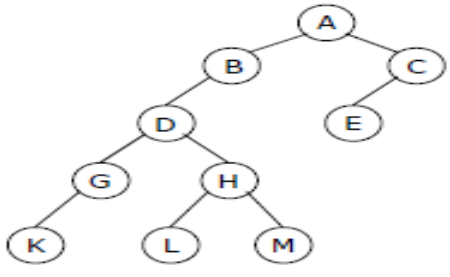
16. Perform pre-order, in-order and post-order traversals for the given tree.

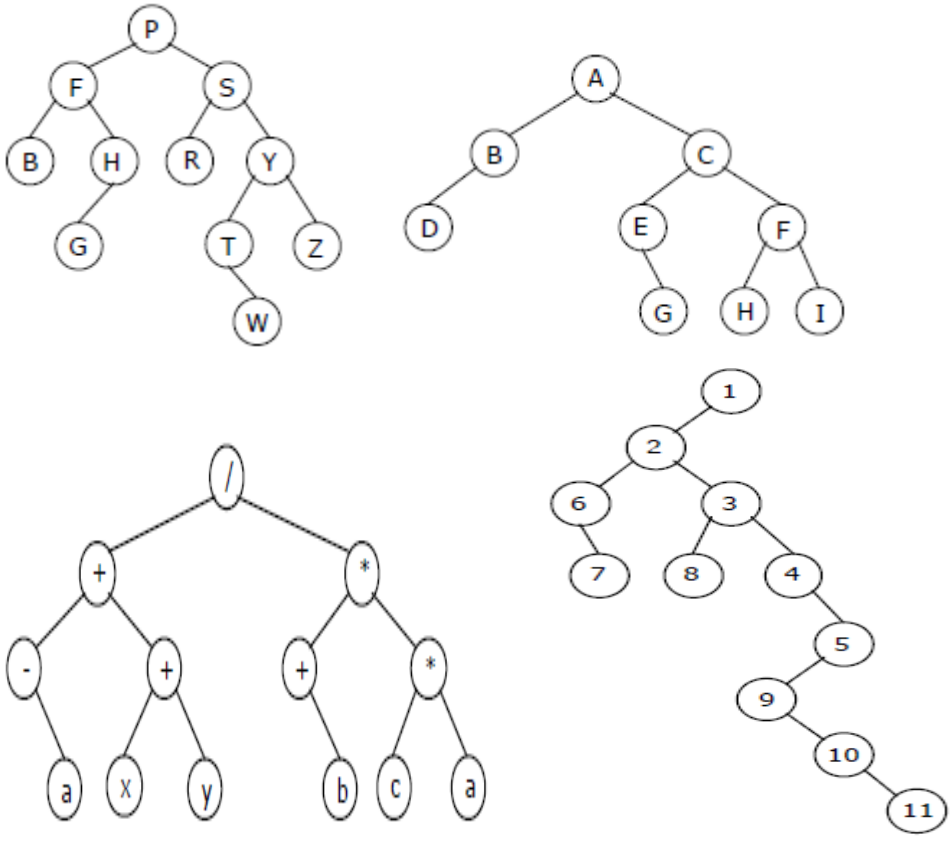












17. Write C functions to perform the following operations:

- Creates a complete Binary Tree
- Inorder traversal
- Preorder traversal
- Postorder traversal
- Prints leaf nodes
- Finds height of the tree created
- Deletes last node

18. Write a "C" function to count the number of leaf nodes in a binary tree.

19. Discuss Non linear data structure and implement Binary Search Tree, with Pre-order, In-order and Post-order traversal functionalities.

20. Draw the binary search tree whose elements are inserted in the following order:

50 72 96 94 107 26 12 11 9 2 10 25 51 16 17 95

i. What is the height of the tree?

ii. What nodes are on level3?

iii. Which levels have the maximum number of nodes that they could contain?

iv. What is the maximum height of a binary search tree containing these nodes? Draw such a tree?

v. What is the minimum height of a binary search tree containing these nodes? Draw such a tree?

vi. Show how the tree would look after the deletion of 29, 59 and 47?

Show how the (original) tree would look after the insertion of nodes containing 63, 77, 76, 48, 9 and 10 (in that order).

21. Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3, 9, 7, 4, 11, 13, and 2, one at a time, into an initially empty heap (min heap or max heap).

22. Show how heap sort processes the input 142, 543, 123, 65, 453, 879, 572, 434, 111, 242, 811, 102.

23. Define heap tree. Construct a max-heap tree for the following numbers and show the individual step.:

i) 35,33,42,10,14,19,27,44,26,31

ii) 12,56,22,45,37,48,67,54,97

iii) 87,54,34,678,45,9,38,18,25,10

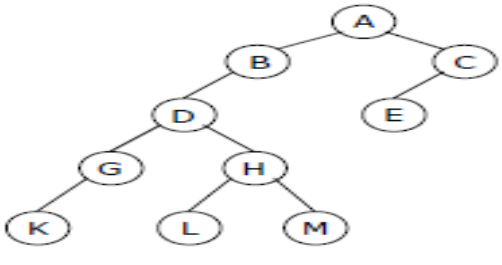
24. Construct a min-heap tree for the following numbers and show the individual step.:

i) 12,56,22,45,37,48,67,54,97

ii) 87,54,34,678,45,9,38,18,25,10

iii) 35,3342,10,14,19,27,44,26,31

25. Explain the memory representation of binary tree. Also represent the given tree in memory (array based and linked based.



26. Define heap tree. Construct a max-heap tree for the following numbers and show the individual step.
90, 70, 105, 120, 170, 45, 175, 350, 30, 90, 130,115

27. Draw the binary search tree whose elements are inserted in the following order: 50, 30,60,38,35,55,22,59,94,13,60,100,20,17,10

i. What is the height of the tree?

ii. Write the nodes on level2.

iii. List the leaf nodes.

iv. Find the minimum and maximum values in Tree.

v. Find the pre-order and post-order traversal for the Tree.

Show how the tree would look after the insertion of nodes containing 66, 70, 78, 48, 8 and 5 (in that order).

28. Write the recursive steps to perform the Pre-order, In-order and Post-order traversal. Apply the traversal technique for the given binary tree.