Data Structure
ASSIGNMENT

ASSIGNMENT-1

INTRODUCTION TO DATA STRUCTURE

1. Define data structure. List the various linear and non-linear data structures and explain them in brief.
2. What does abstract data type means? Briefly explain linear and non linear data structures.
3. Discuss the basic operations performed with linear structure.
4. Explain the dynamic memory allocation functions in C.
5. Differentiate the following terms:(a). Liner and Non-Linear Data Structures (b). Primitive and Non-Primitive Data Structures
6. Define following terms: Time and space complexity of an algorithm.
7. Discuss best case, average case and worst case time analysis with example.
8. Define Algorithm. Write an algorithm to multiply two matrices. Also Perform Time Analysis for the same.
9. Write short note on performance analysis and performance measurement of an algorithm.
10. Write algorithm to sum values in vector V and find out the execution time required.
11. Define Time complexity and Space complexity. Calculate time complexity for given expression. for (k=0; k<n; k++)

```
 {
   rows[k] = 0; for(j=0; j<n; j++)
 {
  rows[k] = rows[k] + matrix[k][j]; total = total + matrix[k][j];
 }
 }
```

ASSIGNMENT-2

LINEAR DATA STRUCTURE

1. Define sparse matrix. Briefly explain representation of sparse matrix with the help of link list and array.
2. Given a two dimensional array A1(1:8, 7:14) stored in row-major order with base address 100 and size of each element is 4 bytes, find address of the element A1(4, 12).
3. Given a two dimensional array Z1(2:9, 9:18) stored in column-major order with base address 100
   and size of each element is 4 bytes, find address of the element Z1(4, 12).

Stack:

1. What is stack? Explain basic primitive operation of stack with example.

2. Differentiate peep() and pop() functions..

3. Write a C program to implement a stack with all necessary overflow and underflow checks using array.

4. Write an algorithm to reverse a string of characters using stack.

5. Write an algorithm to check if an expression has balanced parenthesis using stack.

6. What is recursion? Write a C program for GCD using recursion.

7. Write a recursive algorithm to find factorial.

8. Enlist difference between recursive and iterative algorithms. Write any one recursive function showing the stack contents while function call and return.

9. Write a C user define function for tower of Hanoi for N disk and three towers. Write stack representation for N= 4.

10. Explain Difference between FIFO and LIFO

11. Write a C program for RECOGNIZE algorithm.

12. What is the advantage of Polish expression over infix notation? Write an algorithm to convert an infix expression into reverse Polish expression

13.Convert the given infix expression to postfix and prefix expression.

1) A + ((B – C) * (D – E) + F) / G) $ (H – J)

2) (A + B) * (C – D) $ E * F

3) (A + B) * (C ^ (D – E) + F) – G

4) A + B * C

5) A + B * C ^ D – E

6) A + [(B +C) + (D + E) * F] / G

7) (A + B) * C / D + E ^ F /G

8) (A + B) * C / D

9) ((A + B – C / D) / E)

10) A / (B – C / D ^ E) + F

11) A – B / (C * D ^ E)

2. Evaluate the following expressions. 1) 5 + 4 * 2

2) 4 + 2 * 5 ^ 2 + 9 / 3 – 1 * 8

3) 40 25 + 20 5 * 3 + *

4) 9 + 5 * 7 – 6 ^ 2 + 9 / 3

5) 8 * 2 -1 + 7 * 5

6. Evaluate the following Postfix expression assume A=1, B=2, C=3

1) A B + C – B A + C - +

2) A B C + * C B A - + *

Assignment-3

Linked List:

1. Differentiate between arrays and linked list.
2. Write an algorithm to implement ascending priority queue using singular linear linked list which has insert() function such that queue remains ordered list. Also implement remove() function
3. Write an algorithm to reverse a given single link list.
4. Write a program to insert and delete an element after a given node in a singly linked list. Write a function in any programming language to insert an element in an ordered list.

Doubly Linked List

1. Write a c/c++ program to add two polynomials represented using doubly linear linked list. Also write necessary functions to represent polynomial using doubly linear link list.

2. Write a program in any programming language to concatenate two doubly linked lists.

3. Briefly explain advantages of doubly link list over singly link list. Write function delete (p, &x) which delete the node pointed by p in doubly link list.

Circular Linked List

1. State the advantages of circular and doubly linked lists over a singly linked list. \

2. Write an algorithm to perform each of the following operations on Circular singly linked list using header node

1. add node at the end

2. add node at beginning

ASSIGNEMENT- 4 NONLINEAR DATA STRUCTURE

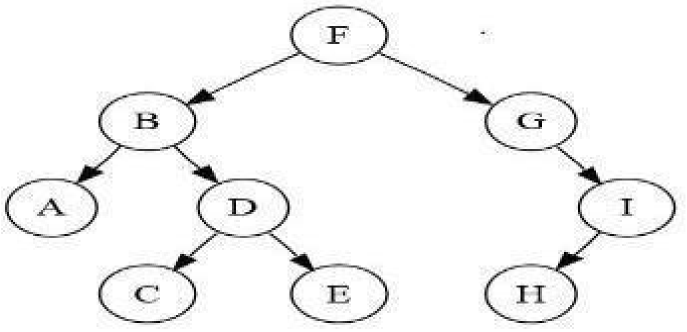
Tree:

1. Discuss following with reference to trees. Tree

2. What are the applications of trees?

3. Construct a tree for the given inorder and postorder traversals Inorder DGBAHEICF Postorder GDBHIEFCA

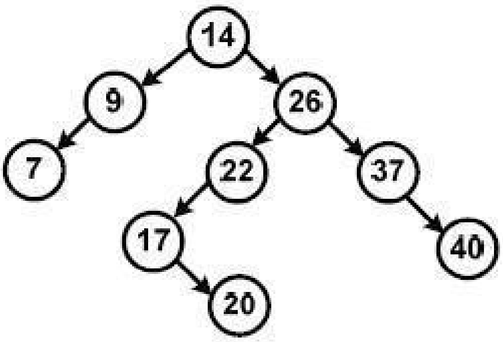
4. Give the preorder and Inorder traversal of the tree given in below fig.



5. Construct binary search tree for the following data 1. 10,3,15,22,6,45,65,23,78,34,5.
   2. 50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5
   3. 40, 65,25, 55, 10,70,30,50,15,80,75
   4. 45,56,39,12,34,78,54,67,10,32,89,81 0
   5. 60, 15, 4, 30, 70, 65, 10, 95, 25, 34

   Find its inorder, preorder and postorder travesal

6. Write an algorithm to perform traversal of Binary search tree
7. First insert 10 and then insert 24. After these insertions, delete 37 and then delete 22 from the following binary search tree. Draw the tree after each operation.



8. Answer the following
    1. The height of a binary tree is the maximum number of edges in any root to leaf path. Define the maximum number of nodes in a binary tree of height h.
    2. Consider a B-tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node?

Graph:

3. Consider the graph shown in below figure**.** Find depth-first and breadth first traversals of this graph starting at A

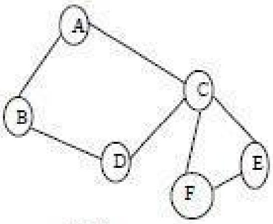


Fig 2

4. Define spanning tree and minimum spanning tree. Find the minimum spanning tree of the graph shown in figure**.**

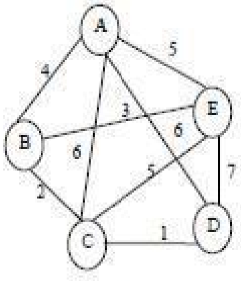
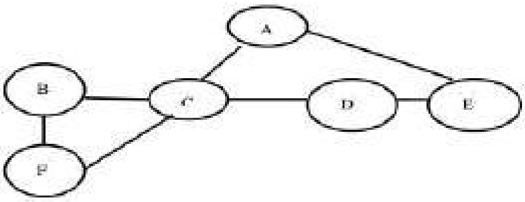
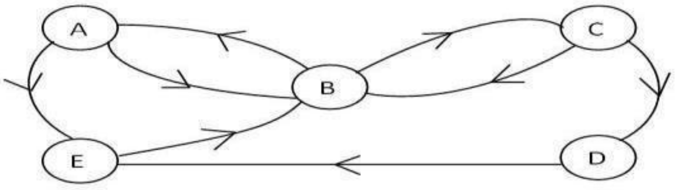


Fig 3

5. Explain the breadth first search and depth first search tree traversal on the following graph.



6.Answer the following for the below given Graph.



1. What is the outdegree of node B.
2. Write down a path from node D to node A.
3. Is the above graph a multigraph? Give a reason for your answer. 4. What is the total degree of node A.

7.Obtain the adjacency matrix A for the following graph. Find A2. Find outdegree of E and D nodes.