

**PART A**

Answer all the questions

(10 x 2 = 20)

1. Trace the following recursive algorithm for  $A=2$  and  $N=5$

**Algorithm F(A, N)**

//To evaluate  $F(A, N)$

1. if  $N > 1$
2.      $term = F(A, \lfloor N/2 \rfloor)$
3.     if  $N \% 2 = 0$
4.          $return term * term$
5.     else
6.          $return term * term * A$
7.     else
8.      $return A$

2. Find the bound for the following algorithm:

**Algorithm DEC\_TO\_BIN(m)**

//Converting a non-negative decimal integer 'm' into binary

1.  $i = 0$
2. repeat
3.      $i = i + 1$
4.      $bin\_no[i] = m \% 2$
5.      $m = \lfloor m / 2 \rfloor$
6. until  $m = 0$
7. for  $j = i$  down to 1
8.     write  $bin\_no[j]$
9. return

3. What is the best case and worst case time complexity of linear search algorithm?
4. Rearrange the following functions in the increasing order of their order of growth:  $n^5$ ,  $\log_2 n$ ,  $n \log_2 n$ ,  $n^2 \log_2 n$ ,  $n$ ,  $2^n$ ,  $n^2$ ,  $n!$ ,  $4^n$
5. Consider the following matrix of order  $4 \times 3$ . It is stored as 2-D array A in column major order starting from location 2500 and assume that each element is stored using 2 bytes. In which location the element  $A(3,3)=20$  will be stored?

12	41	9
18	23	16
35	30	20
22	15	27

6. Represent the following polynomial using array:  
 $P = 2x^{40} - 11x^{26} + 4x^{19} - 3x^{15} - 7x^2 + 2$
7. Consider the following operations on an empty stack of size 3. What will be the contents of stack after each operation?
- |                |                 |
|----------------|-----------------|
| i. Insert 20   | vi. Delete      |
| ii. Insert 17  | vii. Insert 13  |
| iii. Insert 32 | viii. Insert 12 |
| iv. Insert 46  | ix. Delete      |
| v. Delete      | x. Delete       |
8. Assume  $p = 5, q = 7, r = 10, s = 9, t = 6$ . Evaluate the following postfix expression using stack:  $pqr + st - /$ .
9. Write the algorithm for inserting an element into linear queue.
10. Draw the contents after each of the following operations on an empty circular queue Q of size 5 along with front and rear values.
- |                |                |
|----------------|----------------|
| i. Insert 12   | vi. Insert 8   |
| ii. Insert 7   | vii. Insert 16 |
| iii. Insert 30 | viii. Insert 1 |
| iv. Delete     | ix. Delete     |
| v. Insert 25   | x. Delete      |

### PART B

Answer all the questions

(3 x 10 = 30)

11. Write the non-recursive algorithm using stack for finding the minimum number of movements required to move  $N$  discs of increasing diameter from source needle A to destination needle C using intermediate needle B with the following two constraints:
- Only one disc can be moved at a time and placed in any one of the needles.
  - A larger diameter disc should not be placed on top of a lower diameter disc at any point of time during the movement.
12. Convert the following infix expression into postfix expression using stack:  $(a - (b + c) * d + e / (f - g) * h)$ . Write the contents of stack for each iteration.
13. Write the algorithm for adding two polynomials represented using arrays that store non-zero terms.

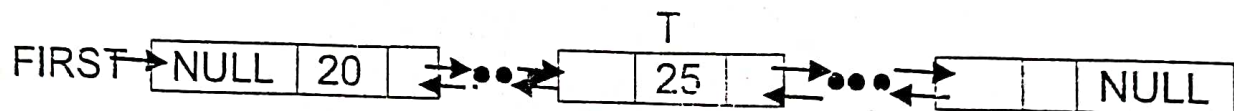


**PART A**

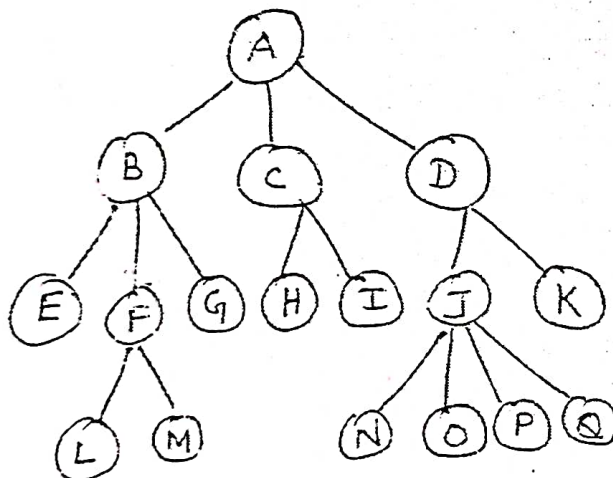
**Answer all the questions**

**(10 x 2 = 20)**

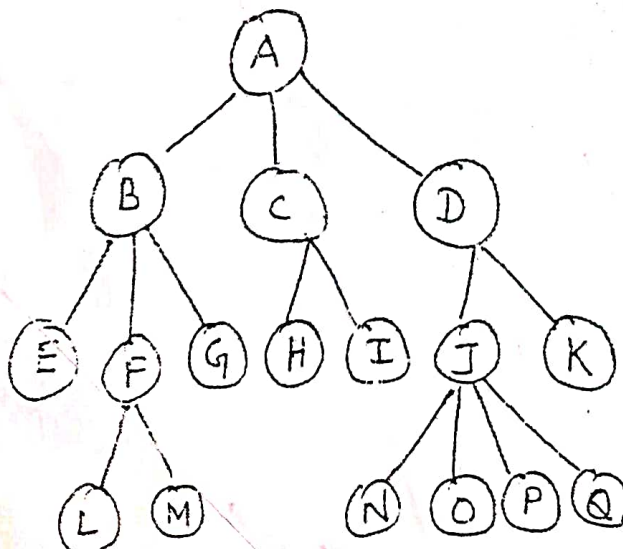
1. Write an algorithm to insert an element into linked queue
2. Write an algorithm to insert an element into beginning of a circular singly linked list.
3. Draw the singly linked list representation for the following polynomial:  $P = 4x^{30} + 17x^{13} + 2x^4$
4. Let T be the address of the node to be deleted from a non-empty doubly linked list. Write the pseudocode to delete the node T.



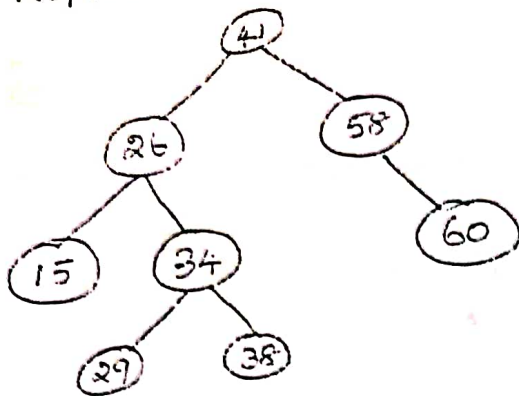
5. Write the parenthetical representation for the following general tree:



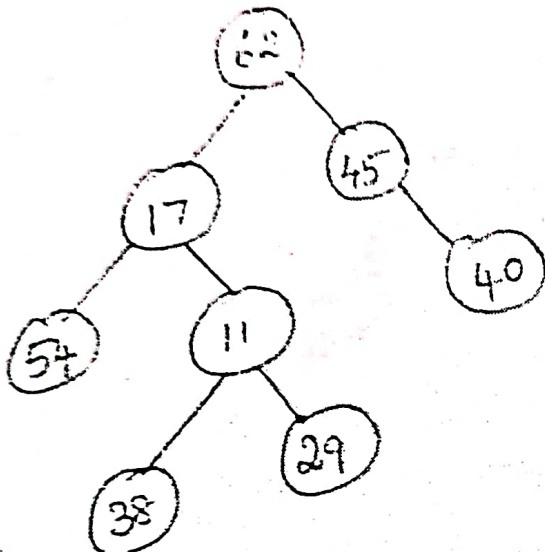
6. Represent the following general tree using linked representation



7. Represent the following binary tree as a sequential array.



8. Find the inorder traversal for the following binary tree:



9. Construct a binary search tree for the following input sequence:  
34, 72, 12, 64, 59, 78, 22, 7

10. Write an algorithm to find minimum element in a binary search tree.

### PART B

Answer any THREE the questions

(3 x 10 = 30)

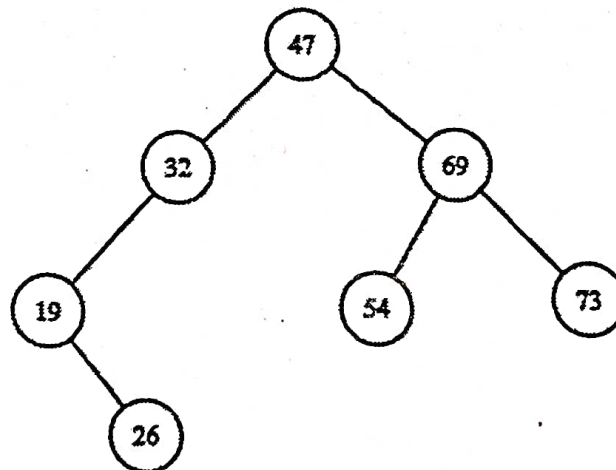
11. Write the algorithm for adding two polynomials represented using singly linked list that store non-zero terms.
12. Write the algorithms to perform insertion, deletion, and search operations in an ordered singly linked list with head node.
13. Write the algorithms to perform insertion at beginning, insertion at end, insertion at specific location into a circular doubly linked list.
14. Write the algorithms to perform insertion, search, and preorder, inorder, and postorder traversals in a binary search tree

**PART - A**

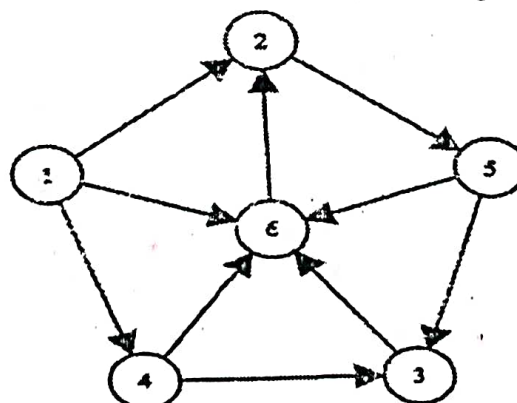
**Answer all the questions**

**(10 x 2 = 20)**

1. Write the recursive algorithm to find the sum of elements in an array.
2. Find the complexity for the following algorithm:  
 Algorithm MAXIMUM(A,n)  
 // To find the maximum element in the array A of n elements.  
 1.  $max = A[1]$   
 2. for  $i = 1$  to  $n$   
 3.     if  $max < A[i]$   
 4.          $max = A[i]$   
 5. return  $max$
3. Write the ADT for Stack
4. Convert the following infix expression into equivalent postfix expression:  $a/b + (c + d) * (e - f) - g/h$
5. Draw the array representation for the following polynomial:  $P = 3x^9 - 7x^5 + 11x^2 - 20$
6. Write an algorithm to search for the position of a given element  $x$  in a singly linked list.
7. Is the following tree an AVL tree or not? If not convert into AVL tree.



8. Represent the following graph as adjacency matrix:





9. Write the contents of the following array after first partition when applying quicksort. Take last element of the array as partitioning element.

	1	2	3	4	5	6	7	8	9	10	11	12
A	65	32	45	77	30	29	11	8	20	54	85	41

10. What are the types of file organization methods?

### PART – B

Answer any TWO questions

(2 x 10 = 20)

11. Write the algorithm for converting an infix expression into postfix expression
12. Write the algorithm for finding inorder predecessor and inorder successor in a threaded binary tree. Also write the non-recursive algorithm for inorder traversal of threaded binary tree.
13. Sort the following array using merge sort: 79, 30, 22, 16, 32, 76, 29, 10, 56, 39, 42, 9

### PART – C

Answer all the questions

(1 x 10 = 10)

14. Represent the following graph as adjacency list and perform breadth first traversal.

