11920

3 Hours / 70 Marks   Seat No. ☐☐☐☐☐☐☐☐

Instructions :   (1)   All Questions are *compulsory.*

(2)   Answer each next main Question on a new page.

(3)   Illustrate your answers with neat sketches wherever necessary.

(4)   Figures to the right indicate full marks.

(5)   Assume suitable data, if necessary.

(6)   Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any FIVE of the following :**   **10**

(a)   Write any four operations that can be performed on data structure.

(b)   Define the terms 'overflow' and 'underflow' with respect to stack.

(c)   Define the following terms w.r.t. tree : (i) In-degree, (2) Out-degree

(d)   Evaluate the following arithmetic expression P written in postfix notation :

P : 4, 2, ^, 3, *, 3, -, 8, 4, /, +

(e)   Describe directed and undirected graph.

(f)   Give classification of data structure.

(g)   Define queue. State any two applications where queue is used.

2.   **Attempt any THREE of the following :**   **12**

(a)   Sort the given numbers in ascending order using Radix sort :

348, 14, 641, 3851, 74

    (b)   Write an algorithm to insert a new node at the beginning and end of the singly linked list.

    (c)   Explain the concept of circular Queue along with its need.

    (d)   Draw a binary search tree for the given numbers :

           50, 33, 44, 22, 77, 35, 60, 40.

3. **Attempt any THREE of the following :**   **12**

    (a)   Explain time and space complexity with an example.

    (b)   Convert the following infix expression to postfix expression using stack and show the details of stack in each step.

           $((A+B)*D)^\wedge(E-F)$

    (c)   Implement a 'C' program to search a particular data from the given array using Linear Search.

    (d)   Draw an expression tree for the following expression :

           $(a - 2b + 5c)^2 * (4d = 6e)^5$

**4.** **Attempt any THREE of the following :**   **12**

    (a)   Find the position of element 21 using Binary Search method in Array 'A' given below :

           A = {11, 5, 21, 3, 29, 17, 2, 45}

    (b)   Differentiate between tree and graph. (Any 4 points)

    (c)   Construct a singly linked list using data fields 21, 25, 96, 58, 74 and show procedure step-by-step with the help of diagram start to end.

    (d)   Show the effect of PUSH and POP operations on the stack of size 10.

           PUSH(10)

           PUSH(20)

           POP

           PUSH(30)

    (e)   Compare Linked List and Array. (any 4 points)

5. **Attempt the following any TWO of the following :** 12

   (a) Implement a 'C' program to insert element into the queue and delete the element from the queue.

   (b) Consider the graph given in following figure and answer given questions.
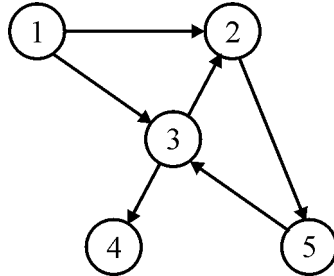
      (1) All simple path from 1 to 5

      (2) In-degree of and out-degree of 4

      (3) Give adjacency matrix for the given graph.

      (4) Give adjacency list representation of the given graph.

   (c) Write an algorithm to search a particular node in the given linked list.

6. **Attempt any TWO of the following :** 12

   (a) Elaborate the steps for performing selection sort for given elements of array.

      A = {37, 12, 4, 90, 49, 23, −19}

   (b) Explain the concept of recursion using stack.

   (c) Show with suitable diagrams how to delete a node from singly linked list at the beginning, in between and at the end of the list.

———————————