

Duration : 2 ^{1/2} Hours

Total Marks : 60

- Q. 1** **Attempt any four of the following** 16
- Write an algorithm to inserting an element 'New' at k^{th} position in the array 'S' of size 'n' where $1 \leq k \leq n$.
 - Consider a two dimensional array A of order 5X4 (5 rows and 4 columns). Suppose base address of array is 500 and each array element occupies two memory cells. If the programming language uses row major order for sorting the array elements, then the address of the element $a[3][3]$ can be calculated by using the formula.
 - Which are different operations perform on Data Structure?
 - Sort the following data items using bubble sort.
34 20 15 65 9 31 18 46
 - Write an algorithm to deletion of the last node of the linked list.
 - Write an algorithm to traverse a one-way linked list to print the elements of the linked list.
 - Write an algorithm to traverse a circular linked list with pointer variable 'Begin'.
 - Write a short note on different categories of linked list.
- Q. 2** **Attempt any four of the following** 16
- Explain linked list representation of stack.
 - Change following infix expression into prefix .
a. $(x - y) * ((z + v)/f)$
 - Convert the following infix expression into their equivalent prefix and postfix expression:
ii. $b + c * d - e + (e \wedge 2 \times f)$
 - Sort the following elements using Quick Sort.
22 3 34 16 4 45 18 68 93 48
 - Write an algorithm to delete an element from the queue.
 - Write an algorithm to remove an element from queue which is maintained using a linked list 'Q' having 'Front' which contains the address of 1st element of the queue and variable 'Rear' which contains the address of last element of the queue.
 - Explain Linked list representation of Queue.
 - Change following infix expression into postfix .
i. $(a + b) / d \wedge ((e - f) + g)$
- Q. 3** **Attempt any four of the following** 16
- Explain linked list representation of Binary tree.
 - Create a Heap for following elements:
15 7 10 2 20 15 80
 - Write an algorithm to sort an array 'H' of size 'n' using Heap sort technique.
 - Explain following terms in graph:
a. Directed graph b. Outdegree and Indegree c. Source and Sink
d. Adjacent Vertices e. Path
 - Which are different operations perform on graph?
 - Explain Depth-First Search(DFS).
 - Explain Spanning tree with an example.
 - How to solve collision for following key values using quadratic probing method.
Key values : 3,2,9,6,11,13,7,12 where $m=10$ and $h(k)=2k+3$

Q. 4

Attempt any Three of the following

12

- a. Consider a two dimensional array A whose subscript limits are $5 \leq i \leq 9$ and $3 \leq j \leq 8$. If the base address of an array is 1024 and each element occupies 1 memory cell then find the address of element $A_{8,7}$ if
 - i. Array is stored in row major order.
- b. Convert the following infix expression into their equivalent prefix and postfix expression:
 - i. $b + c * d - e + (e \wedge 2 \times f)$
- c. Sort following elements using heap sort algorithm:
22 35 17 8 13 44 5 28
- d. Write an algorithm to insert a new element 'Data' at the beginning of the linked list.
- e. What is Stack? Which operations perform on stack?
- f. What is binary tree? Explain it's types.