

**DATA STRUCTURES**  
(Electrical & Electronics Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**  
(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- Give the necessity of asymptotic notations and what are the various notations?
  - List various applications of linked list.
  - Convert the following infix form to prefix and postfix.  
 $((A + B) * C - (D - E)) * (F + G)$
  - Design Hash Division Algorithm.
  - Define complete binary tree with an example.
  - Enumerate the steps to delete an edge from an undirected graph.
  - Differentiate insertion sort with selection sort.
  - Give the time complexity for shell sort and heap sort.
  - Design an algorithm for linear search and give its time complexity.
  - What are the different collision resolution strategies?

**PART – B**  
(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

- 2 (a) Design an algorithm for traversing an array.  
 (b) Define sparse matrix. Show how memory is represented for upper triangular matrix.

OR

- 3 Discuss various operations on Circular Double Linked List with an example.

**UNIT – II**

- 4 Briefly define all the operations of stack by writing algorithms using linked list.

OR

- 5 Write a C program to implement various operations of queue using linked list.

**UNIT – III**

- 6 Prove the following properties of the Binary tree:
- The maximum number of nodes possible in a binary tree of height  $h$  is  $2^h - 1$ .
  - The height of a complete binary tree with  $n$  number of nodes is  $\lceil \log_2(n+1) \rceil$ .
  - For any non-empty binary tree, if  $n$  is the number of nodes and  $e$  is the number of edges then  $n = e + 1$ .

OR

- 7 (a) Define topological sorting.  
 (b) Enumerate steps in Topological Sorting Algorithm.  
 (c) Write a C program for topological sorting

**UNIT – IV**

- 8 Prove that the average case of Quick Sort algorithm is  $O(\log n)$ .

OR

- 9 (a) Explain merge sort with an example.  
 (b) Design an algorithm for merge sort.

**UNIT – V**

- 10 Design recursive algorithm for Binary Search and give its time complexity.

OR

- 11 (a) Define hash function.  
 (b) Discuss about various methods of hash functions with examples.  
 (c) Define bucket hashing.

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