$(2\frac{1}{2} \text{ hours})$

Total Marks: 75

N. B.: (1) <u>All</u> questions are <u>compulsory</u>.

D.

- (2) Make <u>suitable assumptions</u> wherever necessary and <u>state the assumptions</u> made.
- (3) Answers to the same question must be written together.
- (4) Numbers to the <u>right</u> indicate <u>marks</u>.
- (5) Draw <u>neat labeled diagrams</u> wherever <u>necessary</u>.
- (6) Use of Non-programmable calculators is allowed.

Q1 Attempt any three of the following:

15 M

15 M

- a) What is an Algorithm? Explain properties of an algorithm.
- b) What is data structure? Explain primitive and non-primitive data structure.
- c) What is time and space complexity? Explain Big O and Big Theta notation.
- d) Write an algorithm for merging two arrays.
- e) Discus memory representation of one dimensional array.
- f) What is bubble sort? Sort the following data items using bubble sort method. 14, 32, 26, 34, 10

Q 2 Attempt any three of the following:

- a) What is linked list? Write and explain an algorithm to insert an element at the beginning of the singly linked list.
- b) What is circular linked list? How to traverse a circular linked list?
- c) What is header linked list? Explain different categories of header linked list.
- d) Write algorithm to subtract two polynomials.
- e) Write an algorithm for reversing the single linked list
- f) Write an algorithm to copy one linked list into another linked list

Q 3 Attempt any three of the following:

15 M

- a) What is stack? Write an algorithm for PUSH operation.
- b) What is Queue? Explain the operations of queue with suitable example.
- c) Write and explain syntax verification algorithm.
- d) Explain with example priority queue.
- e) Write an algorithm to insert and delete a node from a circular queue.
- f) Convert the following expressions in postfix and prefix notations.
 (i) Iin= (x y) x ((z + y) / f)

(ii) Iin= (x * y) + (z + ((a + b - c) * d)) - I * (j / k)

Q 4 Attempt any three of the following:

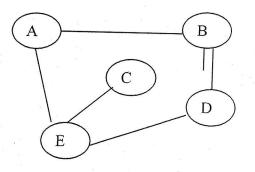
- a) Write an algorithm for Bubble sort.
- b) Sort the following elements using merge sort. 23 56 13 34 78 62 98 53 49 82
- c) Draw the binary tree whose inorder and preorder traversals are:
- In-order : g d b h e i a f c Pre-order : a b d g e h i c f
- d) What is AVL tree? How balancing is done in AVL tree? Explain with example
- e) What are 2-3 trees? How to delete a key value from 2-3 trees?

15 M

f) Sort the following data elements using heap sort algorithm. 22, 35, 17, 8, 13, 44, 5, 28

Q 5 Attempt any three of the following:

- a) What is Graph? Explain directed and undirected graph.
- b) Give the outline of Kruskal's algorithm.
- c) Explain with example Dijkstra shortest path algorithm
- d) Explain Warshall's algorithm of finding path matrix of a graph.
- e) Explain any two collision resolution techniques.
- f) What is Adjacency Matrix? Generate adjacency matrix for the following undirected graph:



15 M