

Time: 3 Hours

OCTOBER 2012

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

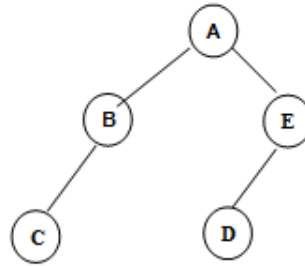
Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. The complexity of adding two matrices of order $m \times n$ is
- (A) $m+n$ (B) mn
(C) $\max(m,n)$ (D) $\min(m,n)$
- b. Which of the following data structure is used in the evaluation of postfix expression?
- (A) Linked List (B) Stack
(C) Queue (D) Tree
- c. Which of the following form of binary tree has the maximum height?
- (A) Complete Binary Tree (B) Almost Complete Binary Tree
(C) Skew Tree (D) Strictly Binary Tree
- d. Which of the following can be used to represent a priority queue?
- (A) Binary Search Tree (B) Heap
(C) AVL Tree (D) B Tree
- e. What is the complexity of Binary Search?
- (A) $O(n)$ (B) $O(n^2)$
(C) $O(n \log n)$ (D) $O(\log n)$
- f. Given the input 10, 15, 3, 27, 9, 20, 12, which of the following sort produces the result 3 10 15 27 9 20 12 in second pass?
- (A) Bubble Sort (B) Selection Sort
(C) Insertion Sort (D) None of the above

- g. Which of the following is false with regard to AVL trees?
- (A) Insertion in AVL tree may cause imbalance in the tree
 (B) Deletion will always keep the tree balanced
 (C) AVL is a binary search tree
 (D) Insertion Operation in AVL tree is $O(\log n)$
- h. Given a binary search tree, which of the following traversal gives a sorted list?
- (A) Inorder (B) Preorder
 (C) Post order (D) Level Order
- i. Which of the following form of graph is used to represent a city map?
- (A) Undirected Graph (B) Directed Graph
 (C) Weighted Directed Graph (D) Weighted undirected Graph
- j. Which of the following data structure is used in breadth first traversal of graph?
- (A) Stack (B) Queue
 (C) Both Stack and Queue (D) Tree

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

- Q.2** a. Define Big-Oh. Suppose $T_1(n) = O(f(n))$ and $T_2(n) = O(f(n))$. Which of the following are true? Justify your answers. (8)
- (i) $T_1(n) + T_2(n) = O(f(n))$
 (ii) $T_1(n) / T_2(n) = O(1)$
 (iii) $T_1(n) = O(T_2(n))$
- b. Represent the following polynomial using array: $4x^5 + 3x^2 + 10 = 0$ (4)
- c. What is a recursive function? Write any one recursive function and describe how the function works. (4)
- Q.3** a. Write an algorithm to copy a linked list. (5)
- b. Write an algorithm to evaluate postfix expression. (5)
- c. Write algorithms for insert and delete operation on a queue implemented using linked list. (6)
- Q.4** a. Represent the following tree using:
- (i) Array
 (ii) Linked list (4)



- b. Write a recursive and non recursive algorithm for inorder traversal of binary tree. **(8)**
- c. Draw a binary tree whose Preorder traversal is A B C D E G F and Postorder traversal is C B G E F D A. **(4)**

Q.5 a. What is a binary search tree? Construct a binary search tree with the keys A, B, D, F, H, K, by inserting the keys one by one starting from an initially empty binary search tree. Write the algorithm for insertion. What is the complexity of the algorithm? **(6)**

- b. What are AVL trees? Explain various types of rotations required in balancing a AVL tree. Illustrate how insertions and deletions are performed in AVL trees by inserting the elements 4, 5, 7, 2, 1, 3, 6 one after the other starting from an initially empty tree. **(10)**

Q.6 a. Write and explain algorithm for binary search. Compare the complexity of linear and binary search. Explain which is preferred over other and when. **(8)**

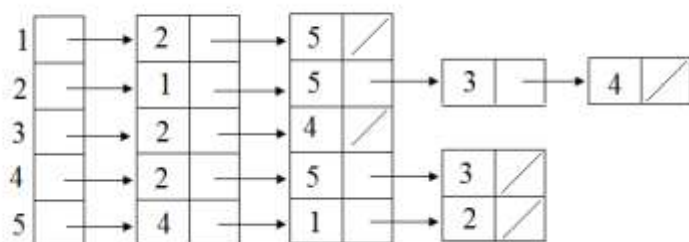
- b. Explain the steps using an example that are involved in creating a heap and performing heapsort thereafter. (8)

Q.7 a. What is meant by hashing? Can a perfect hash function be made? Justify your answer. Explain briefly the various methods used to resolve collision. (8)

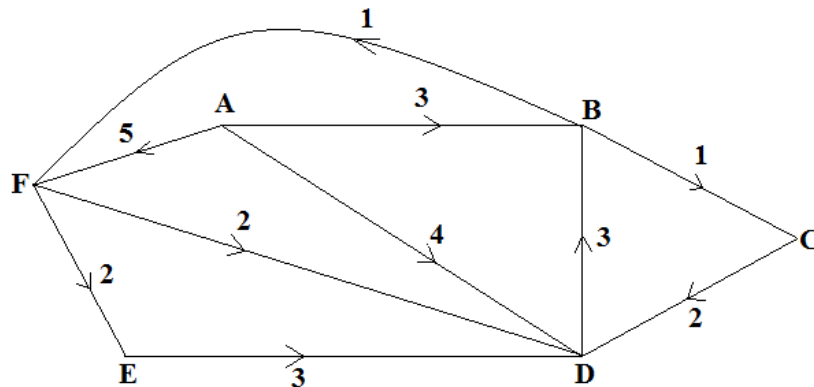
- b. What do you mean by terminal and non-terminal node of a binary tree? Write an algorithm to find the number of terminal and non-terminal nodes in a binary tree. (8)

Q.8 a. Construct the graphs represented by the following
(i) matrix (ii) the linked list. **(4)**

	1	2	3	4	5	6
1	0	1	0	1	0	0
2	0	0	0	0	1	0
3	0	0	0	0	1	1
4	0	1	0	0	0	0
5	0	0	0	1	0	0
6	0	0	0	0	0	1



- b. What are spanning trees? Can a graph have more than one spanning tree? Draw a fully connected graph with 4 nodes and draw the possible spanning trees. (4)
- c. Use Dijkstra's algorithm to find the shortest path from vertex A to the other vertices. (8)



- Q.9** a. Write an algorithm to (8)
- Insert a node after a given node and
 - Delete a node in a doubly linked list
- b. Represent the polynomials $4x^2y^2 + 3x^2y + 2xy + 10 = 0$ using linked list. (4)
- c. Show the results of all passes of Bubble sort in sorting the sequence 56, 78, 12, 4, 98, 72. What is the complexity of Bubble sort? (4)