C 137

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2002

Third Semester

Electronics and Communication Engineering

CS 1151 — DATA STRUCTURES

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write an algorithm to find the factorial of a given number.

2. List the types of control structures.

3. Define ADT.

4. What are the advantages of doubly linked list over singly linked list?

5. Define complete binary tree.

6. How is a binary tree represented using an array? Give an example.

7. Trace the steps of insertion sort to sort – 12, 19, 33, 26, 29 35, 22. Find the total number of comparisons made.

8. What is the principle of radix sort?

9. Define a graph.

10. Define NP–complete problems.

PART B — (5 × 16 = 80 marks)

11. (i) Explain in detail the types of analysis that can be performed on an algorithm.

(ii) Write an algorithm to perform matrix multiplication algorithm and analyse the same.

12. (a) (i) Design an algorithm called REVERSE to reverse the linked list. Trace your algorithm with an example. (8)

(ii) Define an efficient representation of two STACKS in a given area of memory with 'n' words and explain. (8)

Or

(b) (i) What is a queue? Explain. (4)

(ii) Suppose each data structure is stored in a circular array with N memory cells.

(1) Find the number NUMB of elements in a queue in terms of FRONT and REAR.

(2) Find the number NUMB of elements in a dequeue in terms of LEFT and RIGHT.

(3) When will the array be filled? (12)

13. (a) (i) Devise a binary search algorithm that splits a given set into 2 sets where size of one set is twice the size of the other. Trace the algorithm for an example and evaluate its performance when compared to a binary search algorithm. (8)

(ii) What are the different tree traversals? Explain with examples. (8)

Or

(b) (i) Write algorithm to locate an element from binary search tree. (6)

(ii) Draw a binary search tree for the following input list 60, 25, 75, 15, 50, 66, 33, 44. Trace the algorithm to delete the nodes 25, 75, 44 from the tree. (10)

14. (a) (i) Write quick sort algorithm and explain. (8)

(ii) Trace the Quick Sort algorithm for the following list of numbers. 90, 77, 60, 99, 55, 88, 66. (8)

Or

(b) (i) Illustrate inserting an element into a heap with the following numbers. (8)

(ii) Explain the stages of heap sort with an example. (8)

15. (a) (i) Explain the Floyd-Warshall algorithm. (8)

(ii) Explain Prim's algorithm with an example. (8)

Or

(b) (i) Explain Dijkstra's algorithm with an example. Does the algorithm work for paths of negative values? Explain. (10)

(ii) What are strongly connected components? Explain. (6)