T 8113

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Second Semester

Computer Science and Engineering

CS 1151 — DATA STRUCTURES

(Common to Information Technology and B.E. (Part Time) First Semester
Regulation 2005)

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What is meant by top-down design?

2.   What notation is used to specify the complexity of an algorithm?

3.   What is an Abstract Data Type (ADT)?

4.   Define a 'list': Mention any two operations that are performed on a list.

5.   Is the following tree an AVL tree? Justify your answer.
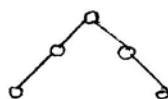
6.   Give a simple hash function when the input keys are integers.

7.   How many passes does the insertion sort algorithm do to sort a list of
     5 elements? What happens in its ith pass?

8.   How many comparisons are done to merge two sorted lists of lengths 'm' and 'n'
     into a single sorted list?

9.   Draw a directed acyclic graph with 4 vertices and give its topological sort.

10. Define the minimum spanning tree (MST) of an undirected graph.

PART B — (5 × 16 = 80 marks)

11. (a) What is the Stack ADT? Give any one implementation of Stack and explain clearly the data structure and the routines used. (16)

Or

(b) How does a queue works? Explain the algorithm for inserting and deleting from a Queue. (4 + 6 +6)

12. (a) (i) Show that the maximum number of nodes in a binary tree of height 'h' is $2^{(h+1)}-1$. (4)

(ii) What is meant by 'collision resolution' in hashing? Explain in detail any one strategy for dealing with it. (12)

Or

(b) (i) Define a binary search tree (BST). Write a routine to insert a node into a BST. (8)

(ii) Give one implementation of a priority queue and explain the routines used. (8)

13. (a) Write down the complete QUICKSORT algorithm and illustrate its working to sort the list (45, 23, 11, 35, 62, 87, 24,66). (16)

Or

(b) Write down the complete HEAPSORT algorithm and illustrate its working to sort the list (25, 73, 10, 95, 68, 82, 22, 60). (16)

14. (a) Explain with examples how a node is inserted into an AVL tree. Discuss all possible cases. (16)

Or

(b) What is an external sort algorithm? Explain, with an example. (16)

15. (a) Write a routine to find a shortest path between two given vertices in a weighted directed graph. Use it to find the shortest path between A and F in the graph of question 15 (b). (16)

Or

(b) Write a routine to find a minimum spanning tree of a weighted directed graph. Use it to find the MST of the following graph. (16)