E 266

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2003.

Third Semester

Information Technology

IF 246 — DATA STRUCTURES AND ALGORITHMS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

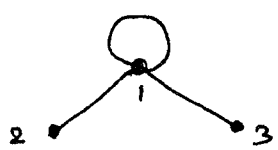
1. What is the order of magnitude for the time required in the multiplication of two dimensional square matrices A and B, each containing n rows and m columns?

2. Write down the BNF rule for describing a digit.

3. What is a linear list?

4. What is a priority queue?

5. Write down the adjacency matrix of the graph.



6. Define a complete binary tree.

7. What is the best case analysis of the quicksort algorithm?

8. Explain polyphase sorting.

9. What are the primary uses of external storage devices?

10. What are the two types of file structures exist for a VSAM file?

PART B — (5 × 16 = 80 marks)

11. (i) Write an algorithm to concatenate two strings to form another string. (8)

(ii) Consider the following grammar with the set of symbols $\{a, b\}$:

$$\langle S \rangle ::= a | b | \langle S \rangle a | b \langle S \rangle$$

Describe the set of strings generated by this grammar. (8)

12. (a) (i) Explain the row-major representation of two dimensional arrays. Extend this concept to an n dimensional array and find the addressing function for an arbitrary element of the matrix. (8)

(ii) Write down the general algorithm model for any recursive procedure using stack. (8)

Or

(b) (i) Write down the algorithm to insert and to delete an element from a queue. (8)

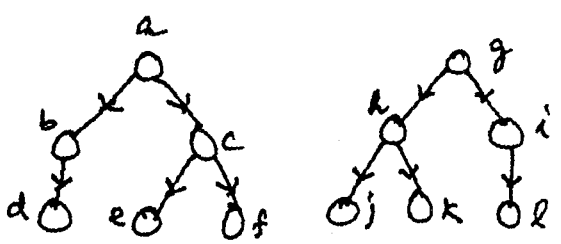
(ii) Given a linked list whose typical node consists of an INFO and LINK field, formulate an algorithm which will count the number of nodes in the list and to free all the nodes in a list. (8)

13. (a) What is traversal? What are the different ways of binary tree traversal and explain with an example? Also explain the converse traversal order.

Or

(b) (i) Write down the general algorithm to calculate the minimal spanning tree. (8)

(ii) Construct the binary tree of the forest shown below : (8)



14. (a) (i) Write down the bubblesort algorithm to sort n elements and illustrate the steps with an array of 8 elements (25, 48, 37, 12, 57, 86, 33, 92). (8)

(ii) Show that the complexity of binary search algorithm for average and worst case is $O(\log_2 n)$. (8)

Or

(b) (i) Write down the general algorithm to perform a radix sort and use it to sort an array of 8 elements (25, 48, 37, 12, 57, 86, 33, 92). (8)

(ii) Discuss any two methods of hashing. (8)

15. (a) (i) What is a magnetic drum? Explain how the data are transferred to or from the drum. (8)

(ii) What is an indexed sequential file due to IBM? How are they processed? (8)

Or

(b) (i) Explain the processing of direct files. (8)

(ii) Discuss the implementation of three buffer system. (8)