Total No. of Questions—12] [Total No. of Printed Pages—4+2

[3662]-276

S.E. (I.T.) (II Sem.) EXAMINATION, 2009

DATA STRUCTURES AND FILES

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagram must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (A) Define frequency count : [6]

Find the frequency count for the given piece of code.

```
Add (a, b, c, m, n)
{
  For i : = 1 to m do
    For j : = 1 to n do
      c [i, j] : = a [i, j] + b [i, j];
}
```

(B) Define sparse matrix. Explain representation of sparse matrix with example. Write the pseudo-code for fast transpose and mention its time and space complexity. [6]

(C) Write pseudo-code for performing merge operation using DLL and find out complexity of the code. [6]

Or

2. (A) Write pseudo-code for binary search and analyse algorithm w.r.t. time and space complexity. [8]

P.T.O.

(B) Define data structures. Explain the entire classification of data structures. [4]

(C) Sort the given list of numbers using quicksort. Show each pass separately : [6]

40 30 10 50 70 60 90 20 80 66

3. (A) Define a binary tree. Define the following terms w.r.t. binary trees and give examples from Fig. 1 : [6]

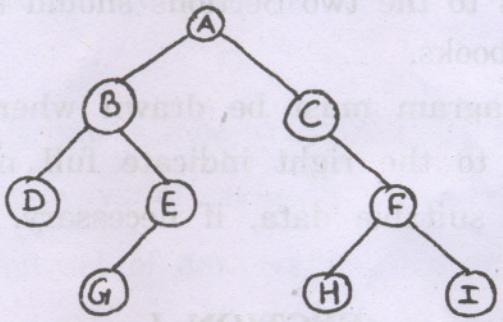

Fig. 1

(*i*) Leaf nodes

(*ii*) Non-leaf nodes

(*iii*) Sub-trees

(*iv*) Ancestor and descendant nodes.

(B) List down the steps to convert a general tree to a binary tree. Convert the given general tree to binary tree (Refer Fig. 2) : [4]

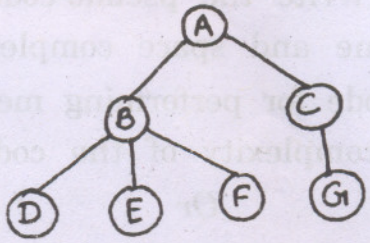

Fig. 2

(C) With an example, define threaded binary tree. Write the algorithm for non-recursive postorder traversal for binary threaded tree. [6]

Or

4. (A) Define depth of a binary tree. What is the depth of the tree in Fig. 1 ? Define with example a strictly binary tree and a complete binary tree. [6]

(B) Define a binary search tree. Build a binary search tree for the given set of nos. :

38 14 56 23 82 8 45 70 18

Show the array representation for the same. [4]

(C) Write pseudo-C code for inserting a node into and deleting a node from a binary search tree. [6]

5. (A) Define a graph. With examples, define the following terms with respect to graphs : [4]

(*i*) Path

(*ii*) Cycle

(*iii*) Connected graph.

(B) Represent the given polynomial using GLL : [4]

$$8x^3y^2z - 5x^2y^3z^2 + 7xyz^3 + 10.$$

(C) Write pseudocode for Prim's method of finding MST of graph. Find MST for the graph having the weight matrix in Fig. 3 : [8]

$$W = \begin{array}{c} \\ X \\ Y \\ S \\ T \end{array} \begin{array}{c} \begin{array}{cccc} X & Y & S & T \end{array} \\ \begin{bmatrix} 0 & 0 & 3 & 0 \\ 5 & 0 & 1 & 7 \\ 2 & 0 & 0 & 4 \\ 0 & 6 & 8 & 0 \end{bmatrix} \end{array}$$

Fig. 3

Or

6. (A) With respect to the graph in Fig. 4, draw the adjacency list and adjacency matrix : [4]

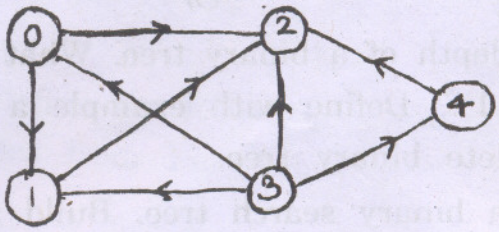

Fig. 4

(B) Write an algorithm for non-recursive DFS traversal of graph and explain it for the graph given in Fig. 5. [6]

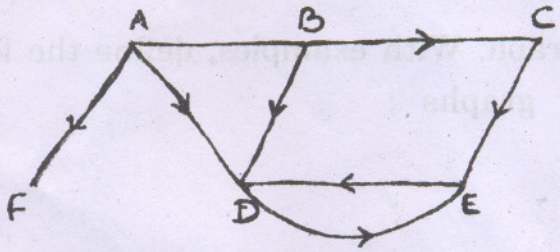

Fig. 5

(C) Write the pseudocode for finding MST using Kruskal's algorithm. Find the same for the graph given in Fig. 6 : [6]

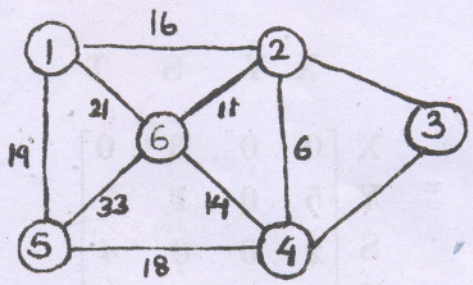

Fig. 6

SECTION II

7. (A) Obtain AVL tree for the following data. Show the balance factor for each node and also the rotation type used : [10]

30, 31, 32, 23, 22, 28, 24, 29, 26, 27, 34, 36

(B) Write notes on : [8]

(*i*) OBST

(*ii*) Static and dynamic trees.

Or

8. (A) Perform heapsort to sort the given list of nos. Show each step for creating a max heap and show each step to sort the heap : [10]

D, A, T, A, S, T, R, U, C, T, U, R, E, S

(B) Suppose A to H are 8 data items with wts as follows : [8]

22, 5, 11, 19, 2, 11, 25, 5

Find a Huffman code for each of the data items.

9. (A) List the characteristics and use of the 'Divide and Conquer' algorithmic strategy. Explain it for the 'Towers of Hanoi' problem. [8]

(B) Distinguish between greedy algorithms and dynamic programming. [6]

(C) Define 0/1 Knapsack problem. [2]

Or

10. (A) List the characteristics and use of the backtracking algorithmic strategy. Explain it for the 8-queens problem. [8]

(B) Write a note on randomized algorithms. [4]

(C) Explain the triangulation problem with respect to dynamic programming. [4]

11. (A) Define hashing. What are the characteristics of a good hash function ? For the given set of data values, create a hash table of size 10 and use linear probing with and without replacement for resolving collision. Use any hash function : [8]

10, 45, 32, 100, 58, 3, 126, 29, 200, 0

(B) Write pseudocode for implementation of simple index file. [4]

(C) Write a note on re-hashing. [4]

Or

12. (A) In hashing, what is meant by collision resolution ? What are the different ways of collision resolution ? [8]

(B) For the given set of data values, create a hash table of size 10 and use chaining with and without replacement for resolving collisions. Use suitable hash function. [8]

9, 45, 59, 13, 75, 12, 88, 11, 46, 105