

DATA STRUCTURE USING 'C'

Full Marks - 70

Time : 3 Hours

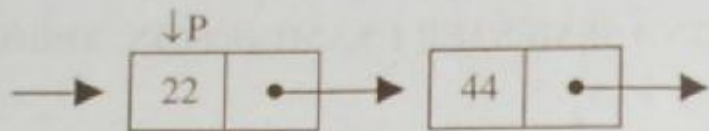
The figures in the right hand margin indicate full marks for the questions.

Answer questions No. 1 and five other questions.

1. Answer the following : 2×10
- (a) Consider an array $a[10]$ of floats; if the base address of a is 1000, find the address of $a[3]$.
 - (b) Given a linked list, a part of which is shown below, write an algorithm for inserting a new

P.T.O.

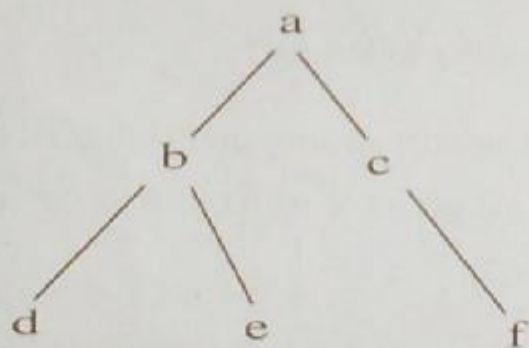
node after the node containing 22 to which the pointer P points



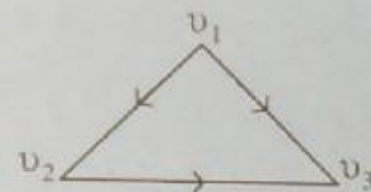
- (c) Define a stack; give two examples (from computer science) where you use stacks.
- (d) Store the following polynomial in a linked list :

$$2x^3 - 5x^2 + 3x - 7$$

- (e) Write down the sequence of nodes that will be processed in the post order traversal of the tree given below :



- (f) A binary tree has 10 nodes; how many edges does it have? Draw a complete binary tree with 10 nodes to check your answer.
- (g) Write down the adjacency matrix of the following graph.



- (h) Convert the following infix expression to postfix expression :-

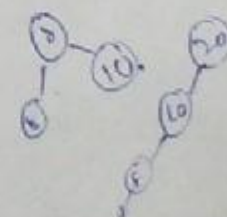
$$(a + b) * (c - d)$$

- (i) With the sequence of inputs

$$10, 8, 20, 5, 3$$

construct a height balanced binary search tree.

- (j) Define recursion; give two examples (from computer science) where you can use recursion.

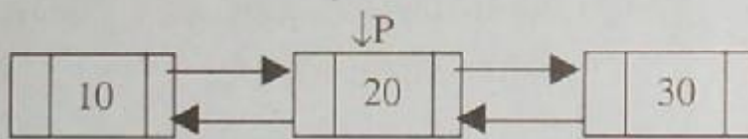


2. (a) Write a C program to (i) create an array of integers and (ii) to print the even integers in the array, (iii) to print every third integer starting from a [0]. 5

- (b) Convert the following infix expression to one in postfix expression : 5

$$x + (y * z - (a / b \uparrow c) * d) * e$$

3. (a) Given a doubly linked list : 5



write a block of C code to delete the node containing 20 to which the pointer P points.

- (b) Use a stack to evaluate the following postfix expression : 5

$$11, 2, -, 3, 2, \uparrow, +, 3, 6, 2, /, 5, *, -, +$$

4. (a) Write a C program to sort a given array of

integers in increasing order, using the bubble sort technique. 5

- (b) Explain the quick sort algorithm. You may use the following sequence of integers to illustrate your case : 5

41, 31, 11, 51, 71, 91, 61, 99, 21, 81

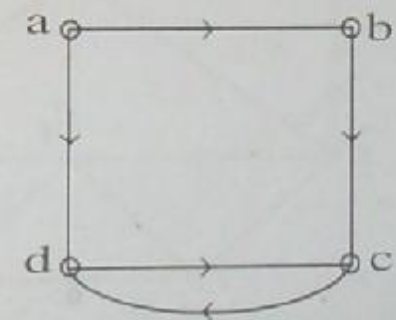
5. (a) Create a heap from the following sequence of integers : 5

50, 40, 60, 80, 70, 20, 90, 10, 8, 2, 5, 100

- (b) Use radix sort to sort the following integers : 5

128, 539, 365, 861, 792, 573, 374, 255, 427.

6. (a) Define a directed graph. Given the directed graph. 5

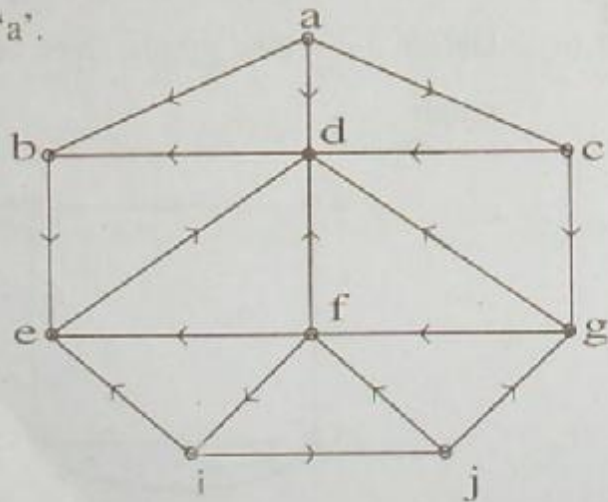


write down its adjacency matrix. Define the reachability matrix of a directed graph. Write down the reachability matrix of the graph given above by inspection.

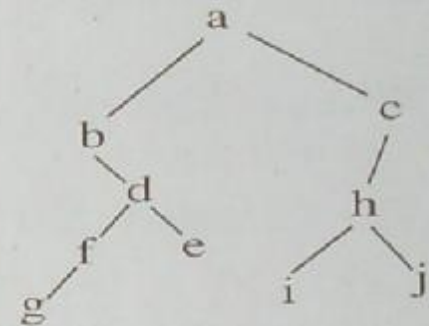
(b) Describe Warshall's shortest path algorithm for a directed graph. 5

7. (a) What do you mean by hashing? Describe any three hash functions with examples. 5

(b) Given the directed graph (below), find the order in which the nodes shall be processed in a breadth-first search, starting from node 'a'. 5



8. (a) Given the tree below, describe the order in which the nodes will be processed in the preorder traversal of the tree. 5



(b) (i) Write a short note on garbage collection. 2

(ii) Define a sparse matrix; how can you store a sparse matrix efficiently? 3