

Time allowed : 3 hours]

[Maximum marks : 100

Note : (i) Attempt total five questions attempting at least one question from each of 4 units.

- (ii) Always write suitable explanation of logic or comments in the program code, wherever needed.
- (iii) In all questions, wherever algorithm or pseudo-code is to be written, you can write equivalent function in C-language syntax also. It will not lead to any deduction of marks. Rather it will be preferable.

## Unit-I

1. (a) A student's record contains name, roll-no and fee. Write a modular program which reads record of n students and displays the details of the student who has paid highest fee. Assume that fee paid by every student is unique. Also find the roll numbers of students whose name start with 'A'.
- (b) Derive formula for addressing an element at a particular index in one-dimension array and explain it.  $1.5+5=20$

2. (a) Using array, implement stack and its operations.

(b) Write algorithm to evaluate a given postfix expression.  
10+10=20

## Unit-II

3. (a) Compare continuous and linked implementation of list.
- (b) Write a function in C to split a given list of integers represented by a single connected linked list into two separate linked lists in the following way. Let the list be  $L = (l_0, l_1, \dots, l_n)$ . The resultant lists would be  $R_1 = (l_0, l_2, l_4, \dots)$  and  $R_2 = (l_1, l_3, l_5, \dots)$ . Do not use any additional nodes.  
8+12=20

4. (a) Write a C program for linked implementation of stack.
- (b) Assume that a doubly linked list exists having one string in each node. Write an algorithm which finds the node having the name of highest length. The position of that node should be displayed as output. Assume that first node is at position 1, second node at position 2 and so on.  
10+10=20

## Unit-III

5. (a) What is use of binary search tree?
- (b) Differentiate between tree and binary tree.
- (c) Write algorithm to count number of internal nodes of a binary tree. Explain its working.  
4+6+10=20

- (3)
6. (a) Differentiate between B Tree and B<sup>+</sup> Tree.  
(b) Write short note on threaded tree.  
(c) Write a function in C for preorder traversal of a binary tree. Without C-syntax, 5 marks will be deducted.

5+5+10=20

#### Unit-IV

7. (a) List the situations when directed graph should be used and when undirected graph?  
(b) What are different techniques for graph traversal? Take a graph of atleast 5 nodes and 8 edges and step by step traverse it using all techniques.
8. (a) Write a C Program for heap sort and explain its working.  
(b) What is use of Hash function? What are its applications?

6+14=20

12+8=20