2022

(November)

COMPUTER SCIENCE

(Elective/Honours)

(CS–101 T)

(Introduction to Data Structure Using C)

Marks : 37

Time : 2 hours

The figures in the margin indicate full marks for the questions

Answer **one** question from each Unit

UNIT—I

1. *(a)* Define algorithm. Write an algorithm to find the smallest element in an array.

   1+3=4

   (b) What is an identifier? State the rules for identifiers in C.   1+2=3

   (c) What is meant by call by reference? Give example.   2½

(Turn Over)

(2)

2. (a) Write a program to find the factorial of a number using recursion. 4½

(b) How is a pointer variable declared? What is a NULL pointer? 1+1=2

(c) What is a self-referential structure? For what kind of applications are they useful? 2+1=3

UNIT—II

3. (a) What is the significance of Big-O notation? Write a note on time-space trade-off. 1+2=3

(b) What is a linked list? Write an algorithm to traverse a singly linked list pointed by P. 1+2=3

4. (a) Define linear queue and state its operations. What is the advantage of a circular queue over a linear queue? 1½+1½=3

(b) Write an algorithm to evaluate a postfix expression. 3

UNIT—III

5. (a) What is a complete binary tree? A binary tree of n nodes has exactly how many edges? 2+2=4

(3)

(b) Explain linked representation of a binary tree. 2½

(c) What is a binary search tree? Write a structure to define a binary search tree in C. 1+1=2

6. (a) What do you mean by traversing a binary tree? Write an algorithm to traverse a non-empty binary tree in post-order. 2+3=5

(b) Define a B-tree. State the characteristics of a B-tree. 1+2½=3½

UNIT—IV

7. (a) Explain briefly two methods of storing graphs in the computer's memory with examples. 4

(b) Discuss depth-first search traversal method of a graph in brief with example. 2½

8. (a) Write down the Dijkstra's algorithm to find the shortest path. 4

(b) What is a minimum spanning tree (MST)? State its importance. 1+1½=2½

(4)

9. *(a)* Write a C function to implement linear search. What is its time complexity?

$$2+1=3$$

(b) Write an algorithm to perform selection sort. $3\frac{1}{2}$

10. *(a)* What is divide and conquer technique? $1\frac{1}{2}$

(b) Write short notes on any *two* of the following : $2\frac{1}{2}\times2=5$

   (i) Division method hash function

   (ii) Linear probing

   (iii) Separate chaining

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