2022

COMPUTER SCIENCE — HONOURS

Paper : CC-3

(Data Structure)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question no.* 1** and ***any four*** from the rest.

1. Answer ***any five*** questions : 2×5

(a) Differentiate between linear and non-linear data structures.

(b) State the two main advantages of using recursive procedure.

(c) How many binary search trees can be formed using 5 nodes?

(d) What is the best case and worst case time complexity of insertion sort?

(e) Define a doubly linked list. Illustrate with the help of a figure.

(f) Name any four hashing techniques.

(g) What is the postfix expression of the infix expression (a + b)*c/d^e?

(h) State any two advantages of using threaded binary tree.

2. (a) Write an efficient algorithm to find an element from a sorted list of elements.

(b) Show the steps to sort the following list of numbers in ascending order using merge sort.

92, 48, –1, 0, 10, 42, 51. 5+5

3. (a) Define min heap.

(b) Construct a min leap with the following elements and then arrange it in ascending order.

200, 10, 90, 60, 100, 50, 150, 40, 20, 70. Show all the steps. 2+(4+4)

4. (a) Write an algorithm to sort the elements of an array using Quicksort.

(b) Convert the following expression into its corresponding prefix expression using stack and evaluate it showing all the steps.

10 + ((7 – 5) + 10) / 2 + 5 * 3 6+4

5. (a) Write the recursive algorithm for post order traversal of a binary tree.

(b) Construct a binary tree using the following pre-order and in order traversal.

Pre-order : A, B, D, E, C, F

In order : D, B, E, A, F, C.

(c) What are the pre-conditions to perform Binary search? 3+5+2

6. (a) Explain the concept of open hashing.

(b) Create a BST using the following elements : 13, 3, 14, 12, 15, 16, 5, 1, 28. Show the steps.

(c) Prove the height of a complete binary tree with n number of nodes is $[\log_2(n+1)]$. 2+3+5

7. (a) State briefly the process of representing a queue with the help of stacks.

(b) What are priority queues? How are they maintained in memory? 4+(2+4)

8. (a) Discuss any two collision resolving techniques.

(b) Discuss a method to represent a 2-dimensional sparse matrix that saves space. (3+3)+4
