This question paper contains 4 printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **1095**

Unique Paper Code : **251406** **E**

Name of the Paper : **Data Structures [CS-2]**

Name of the Course : **B.Sc. (H) Electronics**

Semester : **IV**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. **1** is compulsory.

Attempt any *four* questions out of the remaining Q. No. **2** to Q. No. **7**.

Parts of a question must be answered together.

1. (*a*) Draw a binary search tree for the following sequence :

55, 20, 30 . 66, 61, 50. 80, 15, 8, 85, 75

What is the height of the resultant tree ? 5

(*b*) What are the advantages of doubly linked list over singly linked list ? Write a function to insert an element X at the end in a doubly linked lists. 5

(*c*) Give the infix and prefix expressions for the following postfix expression : 5

9 3 7 8 2 / – * +

P.T.O.

(*d*) What is Hashing ? Take an initially empty hash table with ten slots. with hash function $h(x) = x \bmod 10$. and with collisions resolved by linear probing. put the following data into the correct slot : 5

56. 62. 28. 92. 34. 70. 29

(*e*) Consider the following list of numbers :

60, 30, 21, 23, 50, 9, 75, 89, 1

Apply binary search algorithm to find number 50 in the above list. 5

(*f*) Write a recursive function to add the first n terms of the following series : 5

$1 + 1/2 - 1/3 + 1/4 - 1/5 .....$

(*g*) Give the formula and calculate the address of the element Arr[2][5] of the 2D Array defined as int Arr[6] [6] : 5

(*i*) if the elements are stored in row major order and

(*ii*) if the elements are stored in column major order

The beginning address of the array is 100. Every element requires 4 bytes of storage.

2. Design a class for singly linked list and write the following functions : 2+4+4

(*i*) To add a new node in the beginning

(*ii*) To add a node at a given position p.

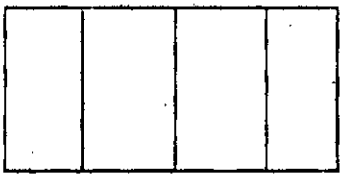
3. Design a class for binary tree and : 2+4+4

   (*i*) Write a non-recursive function to traverse binary tree in preorder.

   (*ii*) Write a function to count number of right children in a binary tree.

4. (*a*) Give an array implementation of a circular queue. What are its advantages ? 6

   (*b*) Show output of the following operations on an empty circular queue Q of size 5 :

Queue : 

Q.enqueue (7);

Q.enqueue (8);

Q.enqueue (3);

Q.enqueue (30);

Q.dequeue ( );

Q.enqueue (12);

Q.dequeue ( );

Q.enqueue (10); 4

5. (*a*) Consider a lower triangular matrix of n × n size. What will be total number of non-zero entries in this lower triangular matrix. Give the mapping for storing and retrieving elements of lower triangular matrix in a one dimensional array. 5

   (*b*) Write a program for addition of two large numbers using stacks. 5

6. (*a*) Draw the binary tree, if the following traversals are given : 5

Inorder : CBDAEF

Preorder : ABCDEF

(*b*) Write a function to check whether two singly linked lists have the same contents or not. 5

7. (*a*) What are self-organizing lists ? For a given sequence BABCADBCADA, show the list after each step using :

(*i*) Transpose and

(*ii*) Count method. 5

(*b*) Write a program to reverse the stack using additional queue. 5