This question paper contains 4 printed pages]

Roll No. ☐☐☐☐☐·☐☐☐☐☐

S. No. of Question Paper : 841

Unique Paper Code : 234201   E

Name of the Paper : **Data Structures [CSHT-203]**

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

Semester : **II**

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*)   Give template class definition for a circular linked list. Write a member function to delete

a particular node from this linked list.   5

(*b*)   For each of the following operations on an array of values, specify whether it can be

performed faster if the array is sorted :   5

(*i*)   Checking if one word is anagram of another word e.g. plum and lump.

(*ii*)   Finding an item with minimum value

(iii)   Computing mean of values

(iv)   Computing median of values

(v)   Finding the value that appears most frequently in the data.

(c)   Write a recursive function for binary search. The function should return the index of the element if it is found else it should return –1.   5

(d)   Show the contents of the stack while evaluating the following postfix expression : 5

BAC + BC × + A– × where, B = 5, A = 9, C = 8.

(e)   Construct a binary search tree for the following keys in the given order :   5

35 70 54 48 18 108 97 45.

Show the preorder, inorder and postorder traversals for the constructed tree.

(f)   Consider an array data [20] [20] each element of which requires 4 bytes of storage. Base address of data is 2000. Determine the location of data [10] [10] when the array is stored as :   5

(i)   Row major

(ii)   Column major.

(g)   Insert the keys 26, 37, 59, 76, 65, 86 into a hash table of size m = 11 using linear probing with hash function as h'(k) = k mod m. Show the status of the table after each insertion. What problem arises if element 26 is deleted from the table. What is the solution to this problem ?   5

2. (a) Define a class to implement a tridiagonal matrix as a 1-D array. Write the member functions to store and retrieve its elements.   6

   (b) Consider the following recursive function :   4

    int f(int x)

    {

      if (x < 2)

        return 1;

      else return f(x–1) + f(x – 2);

    }

    What will be the value of f(5) based on the above code ?

3. Write member functions to perform the following operations on a binary search tree : 3+3+4=10

    (i)   Counting the no. of right children

    (ii) Calculating the height of the tree

    (iii) Deleting a node by merging.

4. (a) Consider the following B tree of order 5 :   6
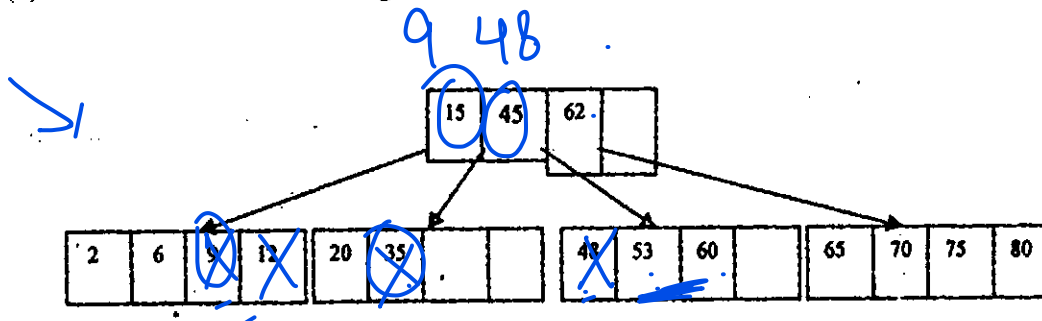
    Insert the following keys one by one in the above B tree :

    38, 58, 40, 42, 55, 64

    Show the status of the tree after each insertion.

P.T.O.

(b) Give the postfix and prefix forms for the following infix expression : 4

$$((A + B) * (C - D)) \wedge (F + G)$$

5. (a) Write the necessary class definition for a queue implemented as a circular array. Include functions for inserting and deleting elements from this queue. 6

(b) Write a function to convert a given integer to its binary equivalent using a stack. 4

6. Write functions for the following : 3+3+4=10

(i) Reversing a singly linked list of integers using only one pass through the list.

(ii) Inserting an element at the end of a doubly linked list of integers.

(iii) Merging two ordered singly linked lists of integers into one ordered list.

7. (a) What are self-organizing lists ? List the *four* methods generally used to self-organize the list. Explain any *one* in brief. 6

(b) What is an activation record ? Explain its use in the context of recursion. 4