

This question paper contains 4 printed pages]

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S. No. of Question Paper : 841

Unique Paper Code : 234201

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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

P.T.O.

- (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
- $BAC + BC \times + A - \times$  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  $h'(k) = k \bmod m$ . 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

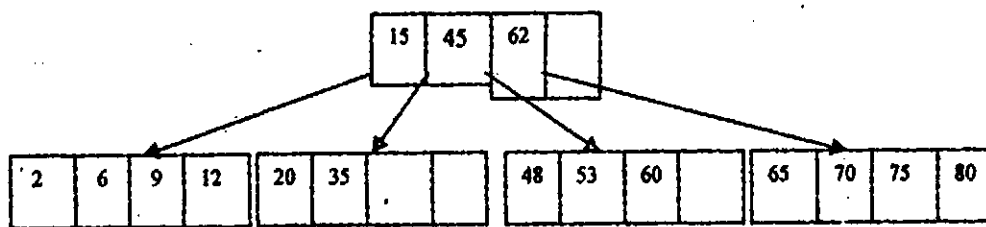
```
int f(int x)
{
    if (x < 2)
        return 1;
    else return f(x-1) + f(x-2);
}
```

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.

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

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

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