

7. (a) Give the class definition for a class named SLL for creating a singly linked list of characters. Write a member function in this class to reverse the contents of stored linked list. (5)
- (b) Write a recursive function to find height of the binary search tree (BST). (5)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3342

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Unique Paper Code : 32341301

Name of the Paper : Data Structures (Under CBCS-LOCF)

Name of the Course : **B.Sc. (Hons.) Computer Science (CBCS-LOCF)**

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory and carries 35 marks.
3. Attempt any **four** questions from Q. No. 2 to Q. No. 7.
4. Parts of a question should be attempted together.

1. (a) Given the following list of 15 sorted integers.

<13, 14, 17, 19, 21, 24, 37, 40, 43, 56, 67, 70, 82, 90, 97>

An element 70 needs to be searched in this list. Which searching technique would you prefer and why? Also give time complexity of the technique. Will your searching technique change if the list is unsorted? Justify. (5)

- (b) Given that a class QUEUE is to be defined using a circular array, write member 5 functions to perform enqueue and dequeue operations for this QUEUE class.

- (c) Build a max-heap using the following data:

<25, 35, 66, 42, 26, 29, 10, 14, 28, 7>

Show the heap after each insertion. Also, remove the root node of the heap and show the resulting heap. (5)

- (d) Create an ADT (Abstract Data Type) class named STACK to implement stack using singly linked list. Write member functions for this ADT to perform push and pop operations. (5)

6. (a) What is height balanced binary search tree? Give an example of it. Also insert the following keys in this tree in the given order :

34, 26, 30, 41, 45, 33, 46, 25, 18

Show the tree after each insertion. (5)

- (b) Write the iterative version for the following recursive function: (5)

```
int fn(int a, int b){
    if (a < b)
        return 0;
    else
        return (1 + fn(a - b, b));
}
```

What will be the returned by the statement fn(14, 5)? (5)

(b) Consider the following list of unsorted numbers:

<8, 20, 9, 4, 15, 10, 7, 12, 23, 14, 6>

Apply bubble sort on the given list of numbers and arrange them in ascending order. Show intermediate steps while performing the sort. Also count the number of comparisons done while sorting the list. (5)

5. (a) Give the necessary class definitions to create a circular linked list of integers where cursor pointer points to a node. Write a function for the following operations:

(i) Insert an element before the cursor pointer.

(ii) Delete an element after the cursor pointer. (5)

(b) Given a class DLL for doubly linked list of characters, write member functions for the following operations :

(i) Count the number of nodes

(ii) Print the list in reverse order. (5)

(e) Which will be the most suitable sorting methods for the following situations? Justify your answers.

(i) A teacher has to sort the answer sheets in an examination hall. The students submit the sheets as and when their work gets over or when- the maximum time for attempting the paper gets over.

(ii) A teacher arranges the students according to their heights by choosing the student with the smallest height first followed by the student with second smallest height and so on. (5)

(f) Consider the following arithmetic expression p, written in postfix notation:

p: A B C - / D E F + * +

(i) Evaluate the postfix expression p and show the intermediate steps using stack for the following values:

A=12, B=7, C=3, D=2, E=1, F=5

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(ii) Translate p into its equivalent infix expression. (5)

(g) Given the hashing function $h(k) = k \bmod 11$ with the size of the hash table 11, show the insertion of the following keys (in order): (5)

<35, 28, 68, 79, 50, 83>

Use double hashing with hashing function as $h(k) = k \bmod 9$ to resolve collisions.

2. (a) Write a function to generate first n numbers of the Fibonacci series using: (5)

(i) Iteration

(ii) Recursion

(b) Create a priority queue for the following list of numbers using min heap: (5)

<25, 15, 11, 5, 14, 80, 60, 30>

Show the steps after each insertion into the priority queue. Also show the resulting priority queue after deletion of the element with minimum priority.

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3. (a) Create a B-tree of order 3 for the data given below :

41, 40, 85, 66, 38, 97, 24, 19, 53, 62, 20, 42

Also show all the intermediate steps while creating the tree. (5)

(b) Construct the binary tree for the following sequence of traversals of nodes :

Inorder: D G B A H E C F

Postorder: G D B H E F C A

Show the steps while constructing the binary tree. (5)

4. (a) A diagonal matrix $A[7][7]$ is given and the starting index is $A[1][1]$. If the base address is given as 550 and each integer takes 4 bytes of memory Find the address of the element $A[4][5]$ if the elements are stored in a one-dimensional array in:

(i) row major order

(ii) column major order (5)

P.T.O.