

[This question paper contains 5 printed pages.]

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Your Roll No.....

B.Sc. (Hons.) COMPUTER SCIENCE / II Sem. B

Paper CSHT 203 : Data Structures

Time : 3 Hours

Maximum Marks : 75

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

Question 1 is compulsory.

*Attempt any four questions out of
the remaining Q2-Q7. Parts of a
question must be answered together.*

1. (a) Write an algorithm that examines whether each occurrence of delimiter is matched with a corresponding delimiter in a string, say, *s*. The algorithm should return true if all delimiters are Matched and false otherwise. The delimiter to be matched may be '{', '[', '(' against '}', ']', ')' respectively. (5)
- (b) Define a class for implementing Queue of data type *X* (using arrays) and size *s*. Write a statement to create a queue of integers of size 10. Details of the methods are not required. *X* is a generic data type. (5)

P.T.O.

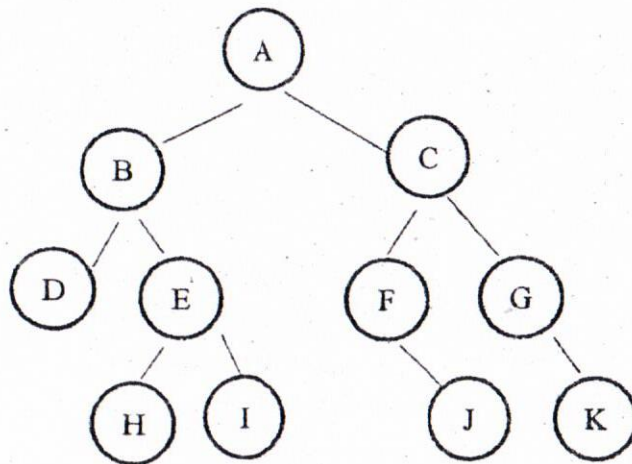
- (c) Consider a list of unsorted elements. An application requires frequent insertions and deletions. Which of the two data structures array and linked list should be used and why? (5)

- (d) Consider the following triangular matrix :

| | | | |
|----|----|---|---|
| 6 | 0 | 0 | 0 |
| 2 | -5 | 0 | 0 |
| 9 | 0 | 1 | 0 |
| -7 | 3 | 8 | 0 |

Show how the elements will be stored in one dimensional array in row major order and column major order? (5)

- (e) Define a class to represent a node of Binary Tree. Traverse the following tree rooted at A, in preorder, inorder, postorder. (5)



- (f) A function $h(n)$ is defined recursively as

$$h(n) = 0 \quad \text{if } n = 0$$

$$h(n) = n \quad \text{if } n > 4$$

$$h(n) = h(n + h(2*n)) \quad \text{if } n \leq 4$$

find the value of $h(1)$ and $h(5)$. (5)

- (g) Consider the following array with exactly 15 elements :

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Suppose binary search is applied for searching an element. Find the elements that can be found in binary search by examining one or two elements from the array. How many comparisons will be done for searching 16 in the above array. (5)

2. (a) Write a function merge that merges two sorted linked lists arranged in ascending order. (5)

- (b) What is an activation record? What all information is stored in activation record? When are they allocated memory and where? (5)

3. (a) Show the contents of stack after each operation when the following postfix expression is evaluated :

$$ABC+*CBA-+*$$

where $A=5$, $B=6$ and $C=4$

(5)
P.T.O.

- (b) A linked list is represented using with head and tail pointers. The following operations are applied on an empty linked list L

```
L.add_at_head(4);
L.add_at_head(6);
L.add_at_tail(7);
L.delete(7);
L.delete_from_tail();
```

Show the status of linked list after each operation. (5)

4. (a) Suppose a skip list has 18 nodes. How many nodes will be there having one pointer, two pointers, three pointers, four pointers? What is the maximum level of node in this skip list? (5)

- (b) Draw a hash table with open addressing and a size of 11. Use the hash function " $k\%9$ " and linear probing for collision. Insert the keys: 5, 29, 20, 0, 27 and 18 into your table (in that order). (5)

5. (a) Write an algorithm that searches for a number X in a binary search Tree. It should throw an exception if element is not found. (5)

- (b) Create a right-in-threaded binary search tree using following data:

25, 10, 11, 65, 12, 15, 70, 80

Show the tree after each insertion (show all the threads and child). (5)

6. (a) Define a class to store 2-D matrix using 1-D array. Define constructor and overload operator() to store and retrieve the i, j th element. (6)

- (b) Write an algorithm to insert a node at the end of a doubly linked list. (4)

7. (a) Write a function to count the number of leaf nodes in Binary Tree. (5)

- (b) Consider the following B-tree with order 5. Delete H, T and R from the following tree. Show the status of B-tree after each deletion. (5)

