

**VIT**Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAIReg. Number: **Continuous Assessment Test (CAT) – II - OCT 2024**

Programme	:	Master of Computer Applications	Semester	:	Fall 2024-25
Course Code & Course Title	:	PMCA501L & Data Structures and Algorithms	Slot	:	G1+ TG1
Faculty	:	Dr. M. Jayasudha	Class Number	:	CH2024250103007
Duration	:	90 Minutes	Max. Mark	:	50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1.	a.	Compute the time complexity of the following recursive function using master method (i) $T(n) = 64T(n/8) - n^2 \log n$ (ii) $T(n) = 7T(n/3) + n^2$ (iii) $T(n) = 2T(n-1) + n$	5
	b.	Trace the following code snippet and derive the time-complexity in terms of Big-oh (Θ) notation: i) void fun(int n) { for(int i=0; i*i<n; i++) printf("%s", "Hello c"); } ii) void fun(int n, int x) { for (int i = 1; i < n; i = i * x) //or for(int i = n; i >= 1; i = i / x) print("welcome dsa"); } iii) void fun(int n) { for (int i = 0; i < n / 2; i++) for (int j = 1; j + n / 2 <= n; j++) for (int k = 1; k <= n; k = k * 2) printf("GeeksforGeeks"); } int main() { int n=8; fun(3); }	5
2.		Rithika, an aspiring computer scientist, is diving into the world of hash functions and their practical applications. She recently learned about a hash function called ' <u>Mid-Square Hashing</u> '. She wants to implement the algorithm to store integer keys in a hash table. <u>Use linear probing to resolve collisions by finding the next available slot.</u> Your task is to help her write an algorithm/pseudocode and find the key with the highest value in the hash table, along with its index.	10

Example

Input:

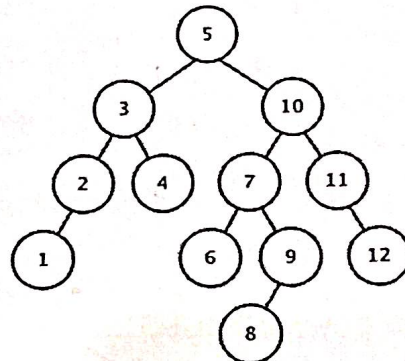
6

42 58 37 29 85 89

Output:

Weight: 89, Index: 92

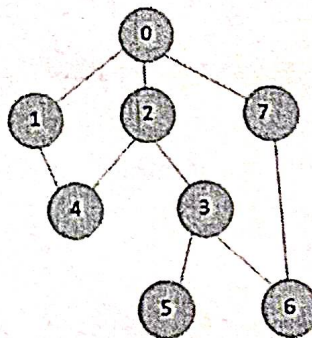
Given the following Self balancing Tree



- a) Draw the resulting BST after 5 is removed, but before any rebalancing takes place. Label each node in the resulting tree with its balance factor. Replace a node with both children using an appropriate value from the node's left child. (5 Marks)
- b) Rebalance the tree that results from 3.(a). Draw a new tree for each rotation(LR or RL) that occurs when rebalancing the tree. (5 Marks)

Specify the pseudo code and step by step illustration of divide and conquer sorting which gives the worst-case time complexity $O(n^2)$ for the following set of elements. 38, 81, 22, 48, 13, 69, 93, 14, 45, 58, 79, 72

Consider the following graph below. Traverse the graph using Breadth First Search and Depth First Search with the initial vertex 0. Illustrate the step-by-step procedure for the traversals.



*****All the best *****