Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Model Question Paper for CAT Exam

Programme	:	**B.Tech**	Semester	:	**Fall 2023-2024**
Course	:	**Data Structures and Algorithms**	Code	:	**BCSE202L**
Time	:	**90 minutes**	Max.Marks	:	**50**

ANSWER ALL QUESTIONS

Q.No	sub Q.No	Question Description	Marks
1		Let L1 be a sorted array in increasing order of size n and L2 be a sorted array in decreasing order of size m. Write an algorithm with O(n) running time to compute kth smallest element in L1 U L2 for a given L1, L2 and k. Illustrate your algorithm for any sample input. For example, L1={10,11,15,16,17) and L2 = {14,13,9,8} and 4^{th} smallest element in L1UL2 is 13.	10
2		Given a sorted list L, design an efficient iterative/recursive algorithm that searches all pairs of elements whose sum is exactly equal to the given number X. Analyze the time complexity of the algorithm.	10
3		Can the master method be applied to the recurrence $T(n) = 4T(n/2)+n^2 \log n$? Why or why not? Give an asymptotic upper bound for this recurrence.	10
4		Assume Two-Dimensional Sorted Array (TDSA) is a two-dimensional matrix of size n × n such as the elements in the matrix are sorted row-wise and column-wise. For example, the following matrix is a TDSA. 1 2 3 4 5 6 7 8 9 Write a pseudo code should convert the given matrix of a dimension n × n into TDSA. Analyze the running time of the your pseudo code.	10

5		Consider a stack S contains a set of positive integers. A number 'x' is said to be a duplicate number if it is present more than one time in the stack. Write a pseudo code to remove all duplicate numbers in the S and print the elements of the stack in reverse order. Compute the running time of your pseudo code.	10