Reg. No.:

Name :

VIT®

Vellore Institute of Technology

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

CAT I Examination – September 2022

Programme	:	**B.Tech**	Semester	:	**Fall Sem 2022-2023**
Course Code	:	**BCSE102L**	Class Nbr	:	**CH2022231002276**
Course Title	:	**Structured and Object-Oriented Programming**			
Faculty	:	**Dr. T. Raja Sree**	Slot	:	**E1**
Time	:	**1½ Hours**	Max. Marks	:	**50**

Answer all the Questions

Q. No.	Sub-division	Question Text	Marks
1.		Write a program in C to collect the details of the 3 boats (Name, seat capacity, hours of ride, cost per person) in a water theme park for a ride. Calculate the cost per person for each boat. Prioritize and display the boats in ascending order based on cost per person. Hint: [cost per person = rent/(hours * seat capacity)].	10
2.		The two roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using the following formula: $b^2 - 4ac$ is called the discriminant of the quadratic equation. If $b^2 - 4ac$ is positive, then the equation has two real roots. If $b^2 - 4ac$ is zero, the equation has one root. If $b^2 - 4ac$ is negative, the equation has no real roots. Write a program that prompts the user to enter values for a, b, and c and displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is 0, display one root. Otherwise, display "The equation has no real roots".	10
3.		You are asked to design AI-based applications that understand human languages. The virtual assistant project is being worked on by the speech processing team. You were hired as a Data Engineer for this project. As a data engineer, your first task is to build a vowel recognition dataset. This task requires finding the presence of vowels in all possible substrings of the given string. Write a C program to find the total number of vowels in a given string.	10
4.		Mr. Hawkins is pursuing a bachelor's degree in Mechanical Engineering. He will be taking a computer science exam this semester. His internal marks deteriorated due to his lack of preparation for prior monthly assessments. His computer science professor offered him one more opportunity to improve his internal markings. The Professor assigns an internal boot-up program to Hawkins. So, Hawkins wants to solve a given problem, Given two arrays A and B of equal size n, the task is to find the minimum value of A[0]*B[0]+A[1]*B[1]+ ... +A[n-1]*B[n-1], where shuffling of elements of arrays A and B is allowed. Can you help him out with your program in answering that question?	10
5.		Let's consider that inside the classroom there is an 'M' row of benches. The 'N' students will also arrive individually and take their seats. Each student has the desired row number (rows are numbered from 1 to M) and all rows have a maximum capacity of K seats. The students come one by one starting from 1 to N and follow the rules below for seating arrangements:	10

- Every student will sit in his/her preferred row (if the row is not full)
- If the preferred row is fully occupied, the student will sit in the next vacant row starting from the first row (so, the next row for N will be 1).
- If all of the seats are occupied, the student will not be able to sit anywhere.

Mr. Jack wants to know the total number of students who didn't get to sit in their preferred row. (This includes the students that did not get a seat at all).

⇔⇔⇔