H/E/TY

Reg. No: 24BCE0530

VIT

Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BCSE102L - Structured and Object-Oriented Programming

Class NBR(s): 1453/1465/1477/1495/1516/1552/1560/ 1572/1585/1592/1661/1663/6191

Slot: G1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Write a program in C that provides a menu-driven interface for performing basic arithmetic operations: Addition, Subtraction, Multiplication, and Division. The menu should present users with clear options to select the desired operation, using a switch case for logic implementation.

   Menu

   i. Add two number
   ii. Subtract two number
   iii. Multiply two number
   iv. Divide two number
   v. Break

2. Given a chess board having N X N cells, you need to place N queens on the board in such a way that no queen attacks any other queen.

   Input:

   The only line of input consists of a single integer denoting N.

   Output:

   If it is possible to place all the N queens in such a way that no queen attacks another queen, then print "YES" (without quotes) in first line, then print N lines having N integers. The integer in i^{th} line and j^{th} column will denote the cell (i,j) of the board and should be 1 if a queen is placed at (i,j) otherwise 0. If there are more than way of placing queens print any of them.

   If it is not possible to place all N queens in the desired way, then print "NO" (without quotes).

   Constraints: $1 \leq N \leq 10$

Sample input	Sample output
4	Yes 0 1 0 0 0 0 0 1 1 0 0 0 0 0 1 0

3. a) What are the functions available in C for dynamic memory allocation? Provide a description of each function along with its syntax. [5]

b) Create a C program to find the largest and smallest elements in an array using dynamic memory allocation. [5]

4. Define a structure named cricket to store the following details: the player's name, the team name, and their batting average. Utilize this structure to declare an array named player with 10 elements. Write a C program to input information for all 10 players and display a team-wise list of players along with their respective batting averages.

5. a) Explain how a member function of a class can be defined outside the class, supported by a clear and concise example. [5]

b) Highlight key characteristics of constructors and destructors, along with their respective syntax and example. [5]

6. Mr. Sunil has deposited ₹10,000, ₹15,000, and ₹20,000 in KVB, IB, and SBI banks, respectively. Develop a C++ program following these steps to display the amount he deposited in a specific bank:

i. Create a base class Bank with a member function getBalance that returns 0.
ii. Derive three subclasses named KVB, IB, and SBI, each with their own getBalance function returning the amount deposited in their respective banks.
iii. Use objects of the subclasses to invoke the getBalance function and display the results.

7. Create a `Fraction` class that represents a fraction consisting of a numerator and a denominator. Overload the (+) and (-) operator to perform addition and subtraction of two fractions and return the result as a simplified fraction.

Sample input	Sample output
1 2 3 4	5/4

8. You're tasked with creating a function capable of calculating the sum of elements within a container. The container may store elements of varying types. Design a function template that can handle this scenario and compute the sum for any type of container.

Sample input	Sample output
1.1, 2.2, 3.3, 4.4, 5.5	16.5

9.a) Write a program in C to merge two arrays of the same size sorted in descending order.

Test Data :

Input the number of elements to be stored in the first array :3
Input 3 elements in the array :
element - 0 : 1
element - 1 : 2
element - 2 : 3
Input the number of elements to be stored in the second array :3
Input 3 elements in the array :
element - 0 : 1
element - 1 : 2
element - 2 : 3

Expected Output :

The merged array in descending order is :
3 3 2 2 1 1

OR

9.b) i. Discuss the key differences between 'call by value' and 'call by reference' in C when passing arguments to functions, and illustrate these concepts with appropriate examples. [5]

ii. Type conversion is a fundamental process in C programming. Provide a detailed explanation of its different types and the rules that govern it. [5]

10.a) Write a program in C to set zero's in the lower triangular of a given matrix and print the final matrix.

Test Data :

Input the size of the square matrix : 3
Input elements in the first matrix :
element - [0],[0] : 1
element - [0],[1] : 2
element - [0],[2] : 3
element - [1],[0] : 4
element - [1],[1] : 5
element - [1],[2] : 6
element - [2],[0] : 7
element - [2],[1] : 8
element - [2],[2] : 9

Expected Output :

The matrix is :
1 2 3
4 5 6
7 8 9
Setting zero in lower triangular matrix
1 2 3
0 5 6
0 0 9.

OR

10.b) Write a C program that allows the user to input two strings. Access these strings using their respective memory addresses to determine whether they are anagrams of each other. Additionally, sort and print the strings in lexicographical order using pointers. (Anagrams are words that contain the same letters in the same quantity but arranged differently, e.g., 'study' and 'dusty').

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