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MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course: B.Tech.

Semester: III

Branch: CSE

Subject Code: CSE 213

Subject Name: Principles of Programming Languages

Maximum Marks: 50

Duration: 3 Hours

Date: 28/11/2024

Time: 9:30 AM to 12:30 PM

Note: Attempt all the questions. Answers should be brief and to the point. Make suitable assumptions wherever necessary and clearly state the same.

Q. No.	Questions	Marks	COs
1.	<p>(A) What are the fundamental features of Functional programming languages and how they differ to other programming paradigms. Give proper example of these features.</p> <p>(B) Why readability of a programming language became its most important evaluation criterion and what are the features of programming languages that affect its readability?</p>	5+5	CO1 CO1
2.	<p>(A) How storage durations associated with any variable affect its behavior in program. Give examples of C++ programming language storage duration?</p> <p>(B) Write a C++ program to demonstrate the Diamond Problem in Inheritance hierarchy. Create a base class A with a method display(), and two derived classes B and C that inherit from A. Finally, create a class D that inherits from both B and C. Modify your program to resolve the ambiguity in accessing the display() method using virtual inheritance. Explain how virtual inheritance prevents the diamond problem.</p>	5+5	CO1 CO2
3.	<p>(A) Write a C++ program which is having a class BOX. This class is having three private data members named as length, height and width. Create five objects of the class BOX with following characteristics:</p> <ol style="list-style-type: none"> 1) Object one and two are of size (1, 2, 3) and (3, 5, 7) respectively. 2) Object three size is sum of the size of object one and object two. 3) Object four is initialized by object three. 3) Object five size is 10 times the size of object four. <p>define constructor, destructor and function to find the volume of the objects. Define all required functions of this program. Display the volume of object five.</p> <p>(B) Write a C++ code to demonstrate the memory leak caused by not using a virtual destructor. Modify the example to include a virtual destructor and explain how it resolves the problem.</p>	5+5	CO2 CO2
4.	<p>(A) Write a C++ program to manage customer information for a mobile service provider. Define a class Customer with the following data members: Customer_name, DOB, Address, Service_plan_no, Fee. Define a method to add a new customer, with an option to join with or without a service plan. Fee calculation logic based on the service plan. A mechanism to track the total number of customers and ensure that every 100th customer gets a fee waiver. In</p>	5+5	CO2 CO2

	<p>Main add multiple customers with different scenarios (with and without service plans), and Display the details of all customers, including any fee waivers applied.</p> <p>(B) How race condition creates problems in concurrent programming and how we can avoid it in C++ program give an example of it. Suppose we have three arrays, first is A1 of 8000000 elements, second is A2 of 5000000 elements and third A3 of 2000000 elements. Write a multithreaded C++ program to find the minimum element of A1 and maximum element of A2. Add minimum of A1 and maximum of A2 to each element of A3.</p>		
5.	<p>(A) Consider the code segment mentioned below:</p> <pre>try { function_A(); try { function_B(); } catch (error1) { Cout<< "Error1" ; } catch (error2) { Cout<< "Error2" ; } function_C(); function_D(); } catch (error3) { Cout<< "Error3" ; } catch (error4) { Cout<< "Error4" ; }</pre> <p>Step-by-step, explain how this code segment will execute if:</p> <ol style="list-style-type: none"> function_A() throws an exception of type error4. function_B() throws an exception of type error2. function_B() throws an exception of type error3. function_C() throws an exception of type error1. <p>(B) Consider the Prolog code mentioned below:</p> <pre>male(john). male(tom). male(bob). female(mary). female(alice). female(susan). parent(john, mary). parent(john, tom). parent(mary, alice). parent(mary, bob). parent(susan, mary). parent(susan, tom). sibling(X, Y) :- parent(P, X), parent(P, Y), X \= Y. grandparent(GP, GC) :- parent(GP, P), parent(P, GC).</pre> <p>Step by step explain how backtracking works to find the result for queries:</p> <pre>?- sibling(mary, S). ?- grandparent(GP, alice).</pre>	5+5	CO3
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