Roll Number: _____	
Thapar Institute of Engineering and Technology, Patiala	
Department of Computer Science and Engineering **MID-Semester Examination**	
BE 3rd Sem	**UTA018: Object Oriented Programming**
Date: 5 Oct 2024, Time: 11:00 AM	**Time: 2Hours, Max Marks:30**
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Note: Attempt all questions (subparts) in sequence at one place. Assume missing data, if any, suitably. Pencil work will not be evaluated.

Q No.	Questions	Marks	CO	BL
Q1	a) Design a class Triangle with private attributes: base and height. Implement a public function compareArea(Triangle &t1, Triangle &t2) that compares the areas of two triangles passed as arguments and returns the triangle with the larger area. b) Design a C++ program with a variable named int count that tracks both the number of items and the number of customers in the same program. Initialize the count variable with no. of items=20 and no. of customers=12, respectively. In main (), display the no. of items only. Ensure that the solution does not use classes and:: operator.	**3** **2**	**CO1** **CO1**	**L3** **L4**
Q2	a) Design a Car class with private attributes, speed, and fuel, and implement a constructor that uses this pointer to initialize these attributes. Develop all the necessary methods required to display the details. b) Explain the following concepts in object-oriented programming with the help of a suitable example: **i. Data Abstraction** **ii. Polymorphism**	**3** **2**	**CO1** **CO1**	**L3** **L2**
Q3	``` class ShoppingCart { private: int cart_id; string customer_name; int item_count; public: ShoppingCart(int id, string name, int count) { cart_id = id; customer_name = name; item_count = count; } ~ShoppingCart() { cout << "Thank you, " << customer_name <<endl; } void display_cart() { cout << "Cart ID: " << cart_id << endl; cout << "Customer Name: " << customer_name << endl; cout << "Number of Items in Cart: " << item_count << endl; }}; ``` You are provided with the ShoppingCart class, as shown above. Write the main() function for the given class. Your task is to: Take input from the user for the number of shopping carts (n) and dynamically create an array of n ShoppingCart objects. Initialize the objects using the parameterized constructor by taking the input at run-time. Display the details.	**5**	**CO1**	**L3**

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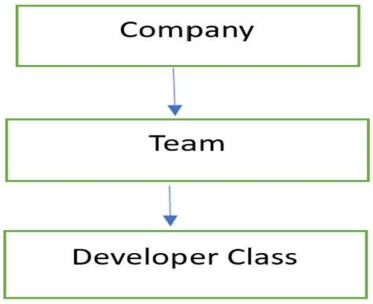
	Finally, release the dynamically allocated memory for the shopping carts before the program terminates.			
Q4	Develop a Donation Management System in C++ that efficiently manages the transfer of donations between accounts utilizing classes. The system consists of the following components: Donor Class contains private data members: string donor_name, double balance. Write the following functions in public section: • set_details(string name, double amount) • display() • double get_balance() Recipient Class contains the private data member: string recipient_name, double account_balance, double amount_required needed by the recipient and the following functions in public section: • set_details(string name, double balance, double amount) • display() • double get_balance() Additionally, the program includes the following function: **transfer (Donor &donor, Recipient &recipient, double amount)** This function facilitates the transfer of funds between a donor and a recipient. This function will verify whether the donor has sufficient funds for the transfer. If the donor has adequate funds, both the donor's and recipient's balances will be updated accordingly. Complete the program using the above-mentioned conditions.	**5**	**CO2**	**L4**
Q5	Implement the class with four private integer data members and public: showdata() function for the below main() code snippet. `int main()` `{` `Number n1;` `Number n2(10,20);` `Number n3(30,40,50,60);` `Number n4(n2);` `Number n5=n1;` `n1.showdata();` `n2.showdata();` `n3.showdata();` `n4.showdata();` `n5.showdata();` `}`	**5**	**CO1**	**L2**
Q6	 Design a C++ program to demonstrate **multilevel inheritance** using the following classes: **Class Company** (Base Class) with attributes: company_name and location. **Class Team** (Intermediate Class): Inherits	**5**	**CO2**	**L4**

	from Company and adds attributes: team_name and project. **Class Developer** (Derived Class): Inherits from Team and adds attributes: developer_name and programming_language. Use a **parameterized constructors** to initialize all the class attributes. Create an object of Developer, and display details from all the classes: Company, Team, and Developer.			

Marks Distribution