OOP Assignment # 2 (100 Marks)

General Instructions:

- Write clean, proper indentations and easy to understand code.
- Use proper dynamic memory management—allocate and **free memory** as required.
- Ensure your code compiles without errors and runs correctly.
- Submit your handwritten assignment by the due date.
- Also submit your assignment on GCR(make pdf by taking pictures of your assignment)

Due Date: first class after Eid ul fiter or before Sessional II exam.

Question 1 (10 Marks) You are tasked with creating a class to track the total number of employees in a company. The class should have a static member variable to store the count of employees, and a static function to increment and display the count. Write the class and a main function to demonstrate the use of the static member and function.
Question 2 (10 Marks) In a company, each employee has a unique ID, and their monthly salary is a constant value. Create a class Employee that has a constant member for the salary. Write a constructor to initialize the employee's ID and use the this pointer to print the address of the current object and the employee's details. Demonstrate this in your main() function.
Question 3 (10 Marks) You are creating a class Car that stores the car's model and year of manufacture. Write a parameterized constructor to initialize the values. Also, write a destructor that prints a message when an object of Car is destroyed. Demonstrate the creation and destruction of objects of the class Car in your main program.
Question 4 (10 Marks) You need to create a class Book that has the title of the book and the author's name. Define a pointer variable for the Book class and allocate memory for a new Book object dynamically. Use the pointer to display the values of the book's title and author. Write the necessary code to handle memory allocation and deallocation.
Question 5 (10 Marks) You are given a class Rectangle with length and breadth as attributes. Write a copy constructor to copy the values of one Rectangle object to another. Demonstrate the use of the copy constructor in the main function.
Question 6 (10 Marks) Consider a class Person with a dynamically allocated string to store the name of a person. You are required to create both a shallow copy and a deep copy of a Person object. Write a copy constructor and an assignment operator that implement shallow and deep copying. In your main() function, demonstrate the difference between shallow copy and deep copy.

Question 7 (10 Marks)

Design a class Employee with attributes such as name, ID, and salary. Create a derived class Manager that adds an additional attribute department and includes a method to display the employee and manager details. Show how the derived class can access the attributes of the base class. Write the necessary code to demonstrate the inheritance and display the details of an Employee and Manager object.

Question 8 (10 Marks)

Create a base class Shape with a private data member area, a protected method calculateArea(), and a public method displayArea(). Derive a class Circle from Shape that implements the calculateArea() method. Show how the derived class accesses the protected base class member and displays the area of the circle. Demonstrate the inheritance and method overriding in the main() function.

Question 9 (10 Marks)

Design a class Vehicle with a startEngine() function and another class Airplane that inherits from Vehicle and overrides the startEngine() function. Demonstrate how the function is overridden and invoked for an object of Airplane. Show the use of both base and derived class functions.

Question 10 (10 Marks)

You need to create a class Person with private data members name and age. Derive a class Student that adds a new data member grade. In the main() function, create a Student object and demonstrate the use of both public and private access members, including how data members are inherited and accessed.