Lab Assignment 2 in C#

Q 1. A software company is developing a user profile management system. Design a class UserProfile with private fields like username, password, and email.

- Provide public methods to set and get the values securely.
- Add validation in setters (e.g., email must contain @, password must be at least 6 characters).
- Test your class with at least two objects.

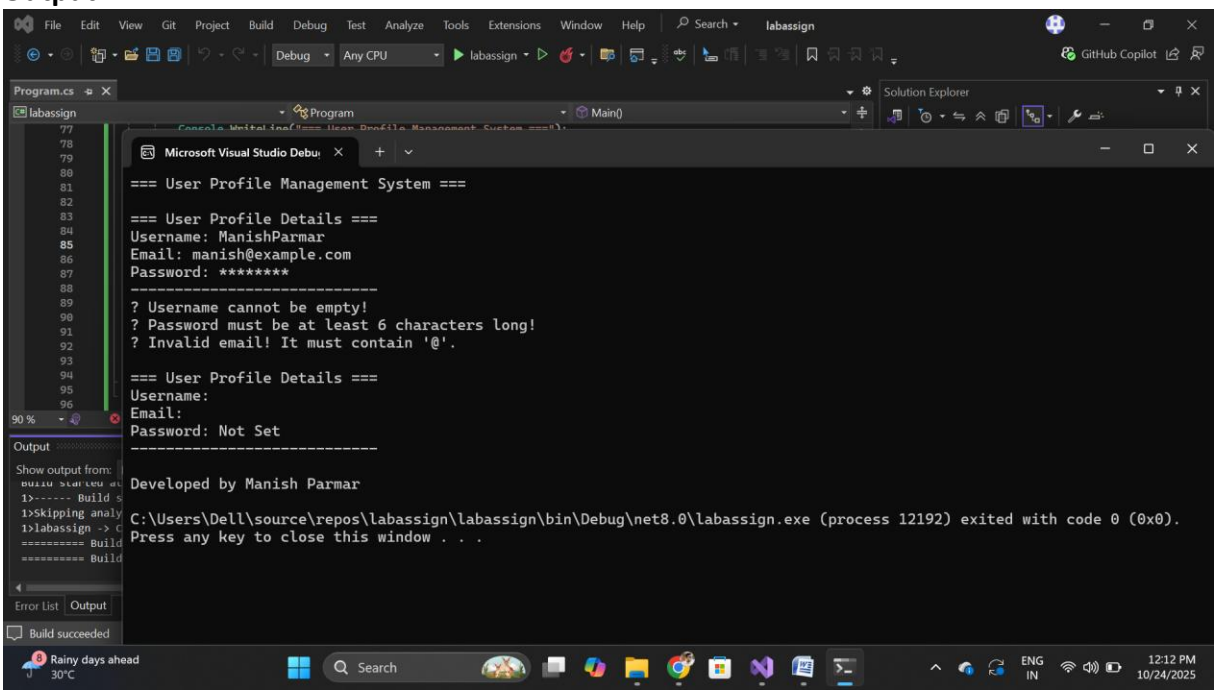
Ans 1.

```
using System;

namespace LabAssignment2
{
    class Userflrofile
    {
        private string username;
        private string password;
        private string email;


        public Userflrofile(string username, string password, string email)
        {
            SetUsername(username);
            Setflassword(password);
            SetEmail(email);
        }


        public void SetUsername(string username)
        {
            if (string.IsNullOrWhiteSpace(username))
            {
                Console.WriteLine("❌ Username cannot be empty.");
            }
            else
            {
                this.username = username;
            }
        }


        public void Setflassword(string password)
        {
            if (password.Length < 6)
            {
                Console.WriteLine("❌ flassword must be at least 6 characters
long.");
            }
            else
            {
                this.password = password;
            }
        }


        public void SetEmail(string email)
        {
```

```
        if (!email.Contains("@") || !email.Contains("."))
        {
            Console.WriteLine("❌ Invalid email format.");
        }
        else
        {
            this.email = email;
        }
    }


    public string GetUsername() => username;
    public string GetEmail() => email;

    public string Getflassword()
    {
        if (password != null)
            return new string('*', password.Length);
        else
            return "Not Set";
    }


    public void DisplayInfo()
    {
        Console.WriteLine($"\nUsername: {GetUsername()}");
        Console.WriteLine($"Email: {GetEmail()}");
        Console.WriteLine($"flassword: {Getflassword()}");
        Console.WriteLine(new string('-', 30));
    }
}

class  flrogram
{
    static void Main(string[] args)
    {
        Console.WriteLine("=== USER flROFILE MANAGEMENT SYSTEM ===\n");


        Console.WriteLine("Enter details for User 1:");
        Console.Write("Username: ");
        string u1 = Console.ReadLine();
        Console.Write("flassword: ");
        string p1 = Console.ReadLine();
        Console.Write("Email: ");
        string e1 = Console.ReadLine();

        Userflrofile user1 = new Userflrofile(u1, p1, e1);


        Console.WriteLine("\nEnter details for User 2:");
        Console.Write("Username: ");
        string u2 = Console.ReadLine();
        Console.Write("flassword: ");
        string p2 = Console.ReadLine();
        Console.Write("Email: ");
        string e2 = Console.ReadLine();

        Userflrofile user2 = new Userflrofile(u2, p2, e2);


        Console.WriteLine("\n=== USER flROFILES ===");
        Console.WriteLine("User 1:");
```

```
            user1.DisplayInfo();

            Console.WriteLine("User 2:");
            user2.DisplayInfo();

            Console.WriteLine("flrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
        }
    }
}
```

Output:



Q 2. You are creating an app for a transport company that deals with different types of vehicles.

- Create a base class Vehicle with properties like Make, Model, and Year.
- Create derived classes Truck and Bus, each having a method DisplayDetails().

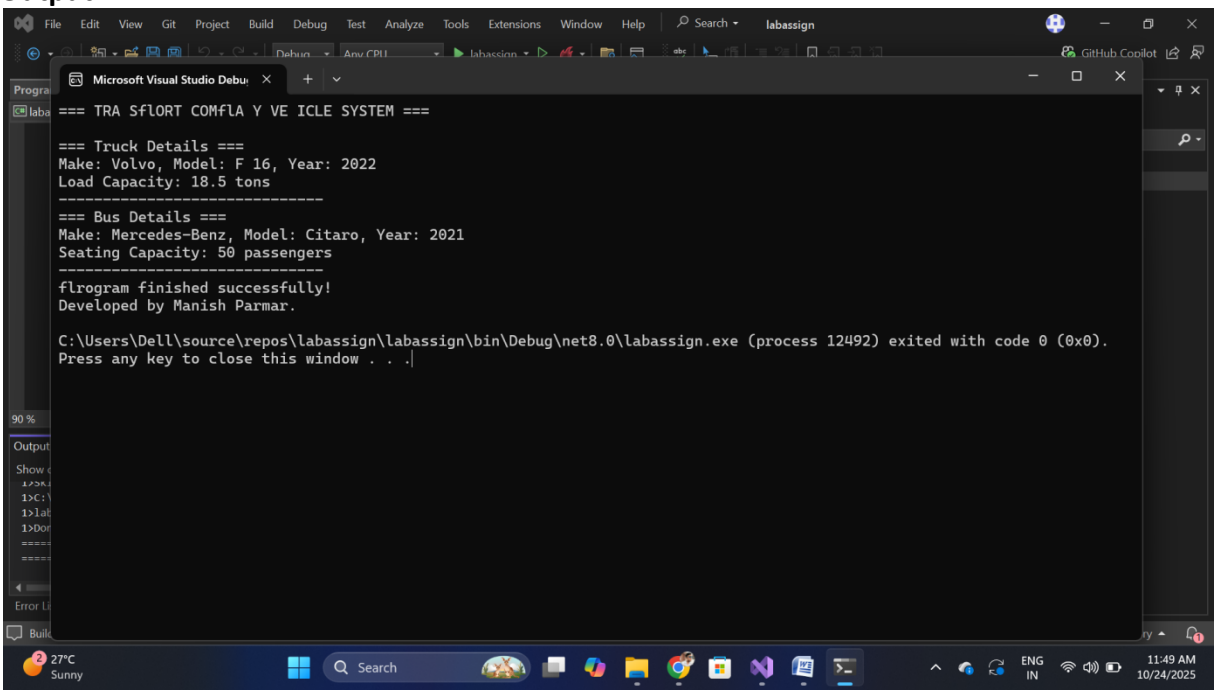
Ans 2.

```
using System;

namespace LabAssignment2
{
    class Vehicle
    {

        public string Make { get; set; }
        public string Model { get; set; }
        public int Year { get; set; }


        public Vehicle(string make, string model, int year)
        {
            Make = make;
            Model = model;
            Year = year;
```

```
    }


    public virtual void DisplayDetails()
    {
        Console.WriteLine($"Make: {Make}, Model: {Model}, Year: {Year}");
    }
}


class Truck : Vehicle
{
    public double LoadCapacity { get; set; }

    public Truck(string make, string model, int year, double loadCapacity)
        : base(make, model, year)
    {
        LoadCapacity = loadCapacity;
    }


    public override void DisplayDetails()
    {
        Console.WriteLine("=== Truck Details ===");
        base.DisplayDetails();
        Console.WriteLine($"Load Capacity: {LoadCapacity} tons");
        Console.WriteLine(new string('-', 30));
    }
}


class Bus : Vehicle
{
    public int SeatingCapacity { get; set; }

    public Bus(string make, string model, int year, int seatingCapacity)
        : base(make, model, year)
    {
        SeatingCapacity = seatingCapacity;
    }

    public override void DisplayDetails()
    {
        Console.WriteLine("=== Bus Details ===");
        base.DisplayDetails();
        Console.WriteLine($"Seating Capacity: {SeatingCapacity} passengers");
        Console.WriteLine(new string('-', 30));
    }
}


class  flrogram
{
    static void Main(string[] args)
    {
        Console.WriteLine("=== TRANSflORT COMflANY VEHICLE SYSTEM ===\n");


        Truck truck1 = new Truck("Volvo", "FH16", 2022, 18.5);


        Bus bus1 = new Bus("Mercedes-Benz", "Citaro", 2021, 50);
```

```
            truck1.DisplayDetails();
            bus1.DisplayDetails();

            Console.WriteLine("flrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
        }
    }
}
```

Output:



Q 3. Build a calculator class that can perform basic operations using method overloading.

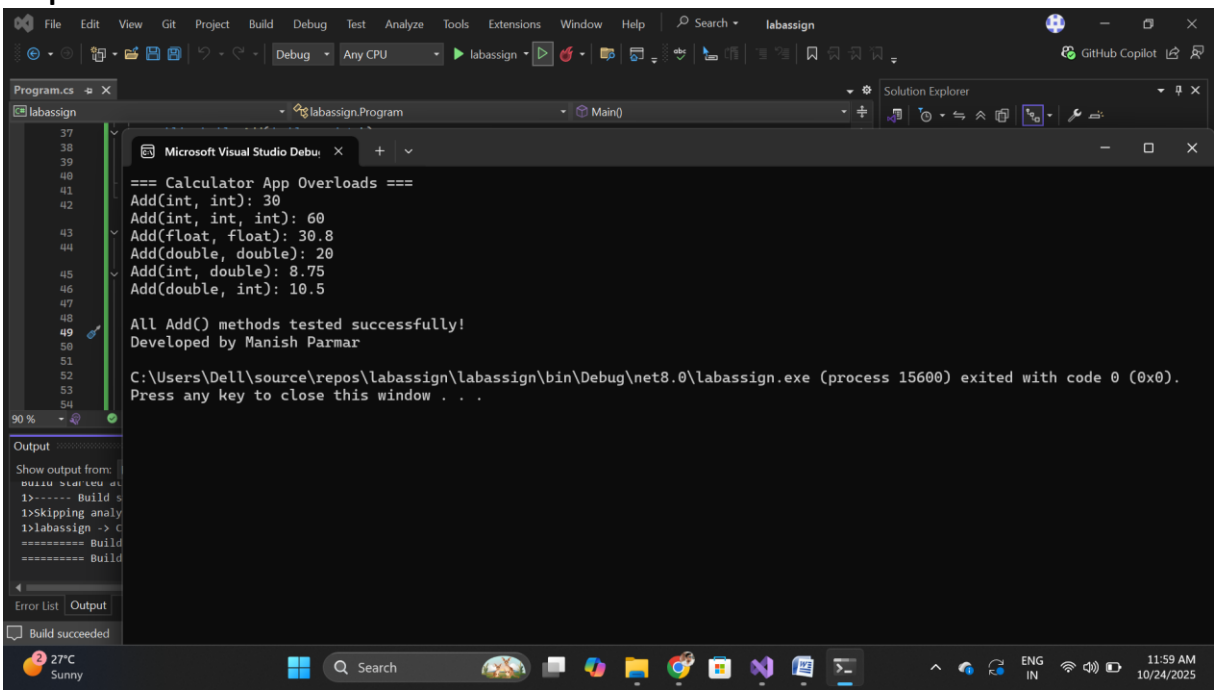
- Implement multiple Add() methods that take different numbers and types of parameters (int, float, double).
- Write a program to test all the variations of the Add() method.

Ans 3.

```
using System;

namespace LabAssignment2
{
    class Calculator
    {

        public int Add(int a, int b)
        {
            return a + b;
        }

        public int Add(int a, int b, int c)
        {
            return a + b + c;
        }
```

```
        public float Add(float a, float b)
        {
            return a + b;
        }

        public double Add(double a, double b)
        {
            return a + b;
        }

        public double Add(int a, double b)
        {
            return a + b;
        }
    }

    class  flrogram
    {
        static void Main(string[] args)
        {
            Calculator calc = new Calculator();

            Console.WriteLine("=== CALCULATOR Aflfl (METHOD OVERLOADING DEMO)
===\n");


            Console.WriteLine($"Add(int, int): 5 + 10 = {calc.Add(5, 10)}");
            Console.WriteLine($"Add(int, int, int): 2 + 4 + 6 = {calc.Add(2, 4,
6)}");
            Console.WriteLine($"Add(float, float): 3.5 + 2.5 = {calc.Add(3.5f,
2.5f)}");
            Console.WriteLine($"Add(double, double): 5.75 + 4.25 =
{calc.Add(5.75, 4.25)}");
            Console.WriteLine($"Add(int, double): 10 + 2.5 = {calc.Add(10,
2.5)}");

            Console.WriteLine("\nflrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar");
        }
    }
}
```

Output:



Q 4. Create an abstract class Employee with abstract method CalculateSalary().

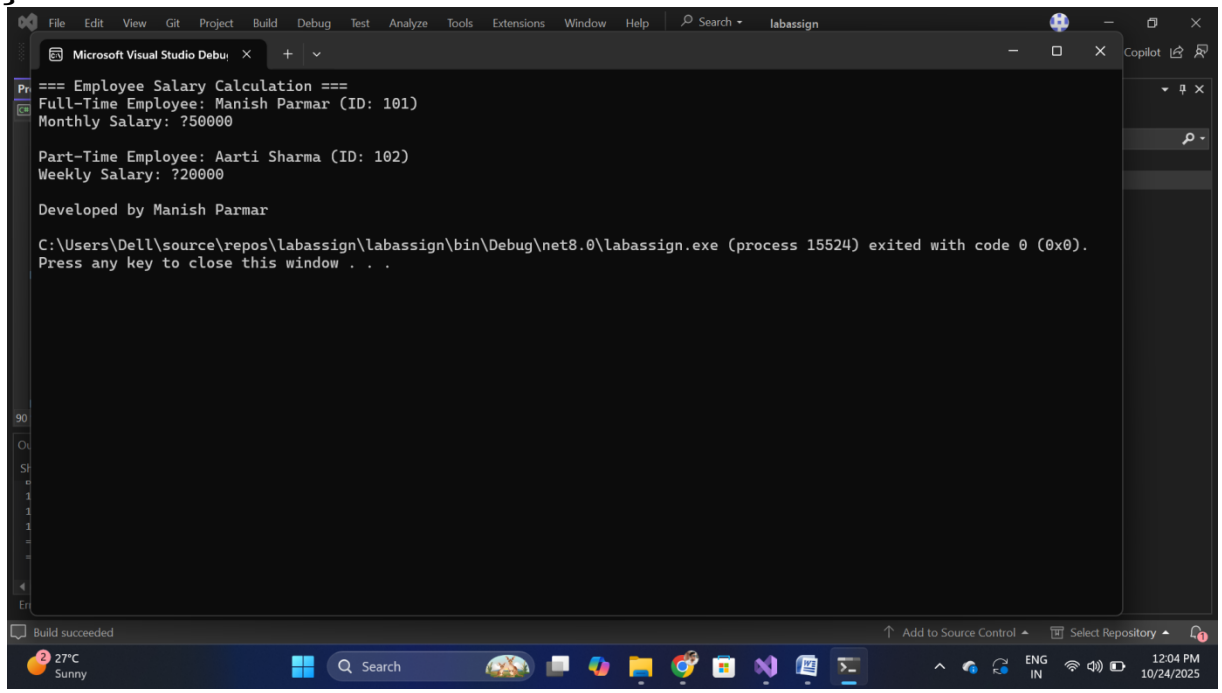
- Derive classes FullTimeEmployee and PartTimeEmployee and implement the salary calculation.
- Instantiate objects and calculate salary for both types.

Ans 4.

```
using System;

namespace LabAssignment2
{
    abstract class Employee
    {
        public string Name { get; set; }
        public int ID { get; set; }

        public Employee(string name, int id)
        {
            Name = name;
            ID = id;
        }

        public abstract double CalculateSalary();

        public void DisplayInfo()
        {
            Console.WriteLine($"Employee Name: {Name}");
            Console.WriteLine($"Employee ID: {ID}");
        }
    }


    class FullTimeEmployee : Employee
```

```
    {
        public double MonthlySalary { get; set; }

        public FullTimeEmployee(string name, int id, double monthlySalary)
            : base(name, id)
        {
            MonthlySalary = monthlySalary;
        }

        public override double CalculateSalary()
        {
            return MonthlySalary;
        }
    }


    class flartTimeEmployee : Employee
    {
        public double HourlyRate { get; set; }
        public int HoursWorked { get; set; }

        public flartTimeEmployee(string name, int id, double hourlyRate, int
hoursWorked)
            : base(name, id)
        {
            HourlyRate  =  hourlyRate;
            HoursWorked = hoursWorked;
        }

        public override double CalculateSalary()
        {
            return HourlyRate * HoursWorked;
        }
    }


    class  flrogram
    {
        static void Main(string[] args)
        {
             Console.WriteLine("=== EMflLOYEE SALARY SYSTEM ===\n");


            FullTimeEmployee emp1 = new FullTimeEmployee("Alice Johnson", 101,
5000);

            flartTimeEmployee emp2 = new flartTimeEmployee("Bob Smith", 102, 25,
80);


            Console.WriteLine("Full-Time Employee:");
            emp1.DisplayInfo();
            Console.WriteLine($"Monthly Salary:  ${emp1.CalculateSalary():0.00}");
            Console.WriteLine(new string('-', 30));

            Console.WriteLine("flart-Time Employee:");
            emp2.DisplayInfo();
            Console.WriteLine($"Calculated Salary:
${emp2.CalculateSalary():0.00}");
            Console.WriteLine(new string('-', 30));

            Console.WriteLine("flrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
```

```
        }
    }
}
```



Output:

Q 5. You are building a student record system.

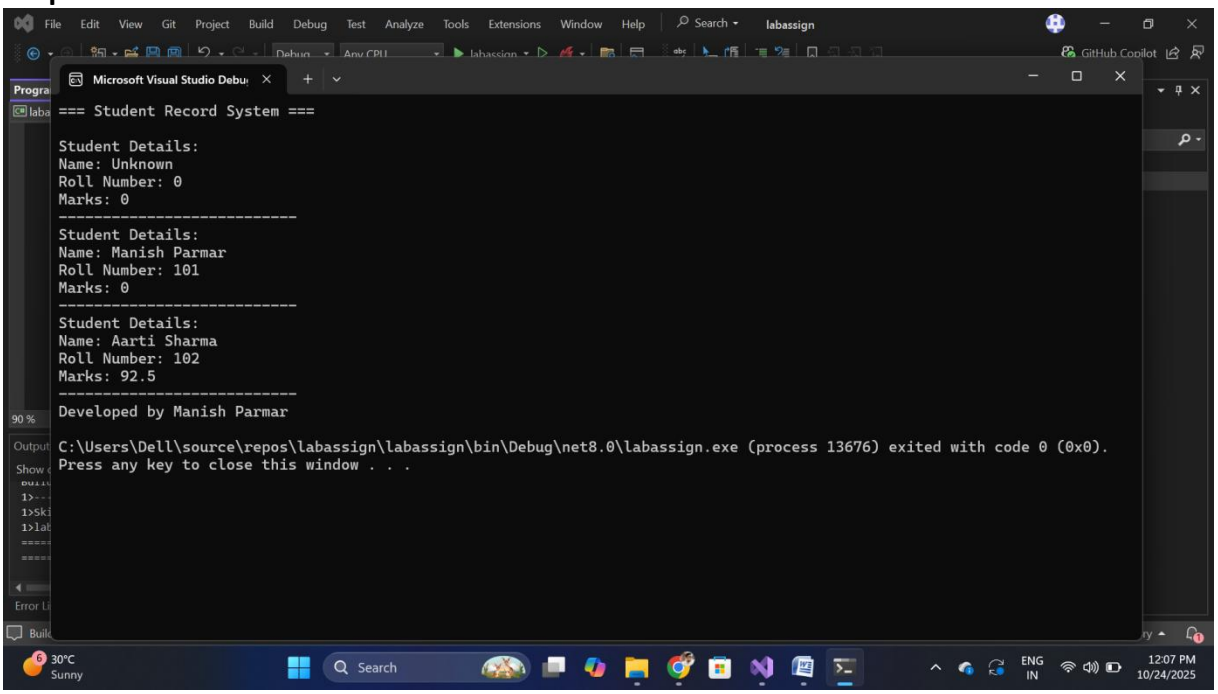
- Create a class Student with overloaded constructors:
    - Default constructor
    - Constructor with name and roll number
    - Constructor with name, roll number, and marks
- Display all student data using a method.

Ans 5.

```
using System;

namespace LabAssignment2
{
    class Student
    {

        public string Name { get; set; }
        public int RollNumber { get; set; }
        public double Marks { get; set; }

        public Student()
        {
            Name = "Unknown";
            RollNumber = 0;
            Marks = 0.0;
        }

        public Student(string name, int rollNumber)
```

```
        {
            Name = name;
            RollNumber = rollNumber;
            Marks = 0.0;
        }


        public Student(string name, int rollNumber, double marks)
        {
            Name = name;
            RollNumber = rollNumber;
            Marks = marks;
        }


        public void DisplayData()
        {
            Console.WriteLine($"Name: {Name}");
            Console.WriteLine($"Roll Number: {RollNumber}");
            Console.WriteLine($"Marks: {Marks}");
            Console.WriteLine(new string('-', 30));
        }
    }

    class  flrogram
    {
        static void Main(string[] args)
        {
            Console.WriteLine("=== STUDENT RECORD SYSTEM ===\n");


            Student student1 = new Student();


            Student student2 = new Student("Alice Johnson", 101);

            Student student3 = new Student("Bob Smith", 102, 88.5);


            Console.WriteLine("Student 1 (Default Constructor):");
            student1.DisplayData();

            Console.WriteLine("Student 2 (Name fi Roll Number Constructor):");
            student2.DisplayData();

            Console.WriteLine("Student 3 (Full Constructor):");
            student3.DisplayData();

            Console.WriteLine("flrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
        }
    }
}
```

Output:



Q 6. Develop a class Product for an inventory system.

- Include auto-implemented properties: ProductID, ProductName, Price, and Quantity.
- Use property validation logic (e.g., Price cannot be negative).
- Write a method to print product details and test it with valid and invalid inputs.

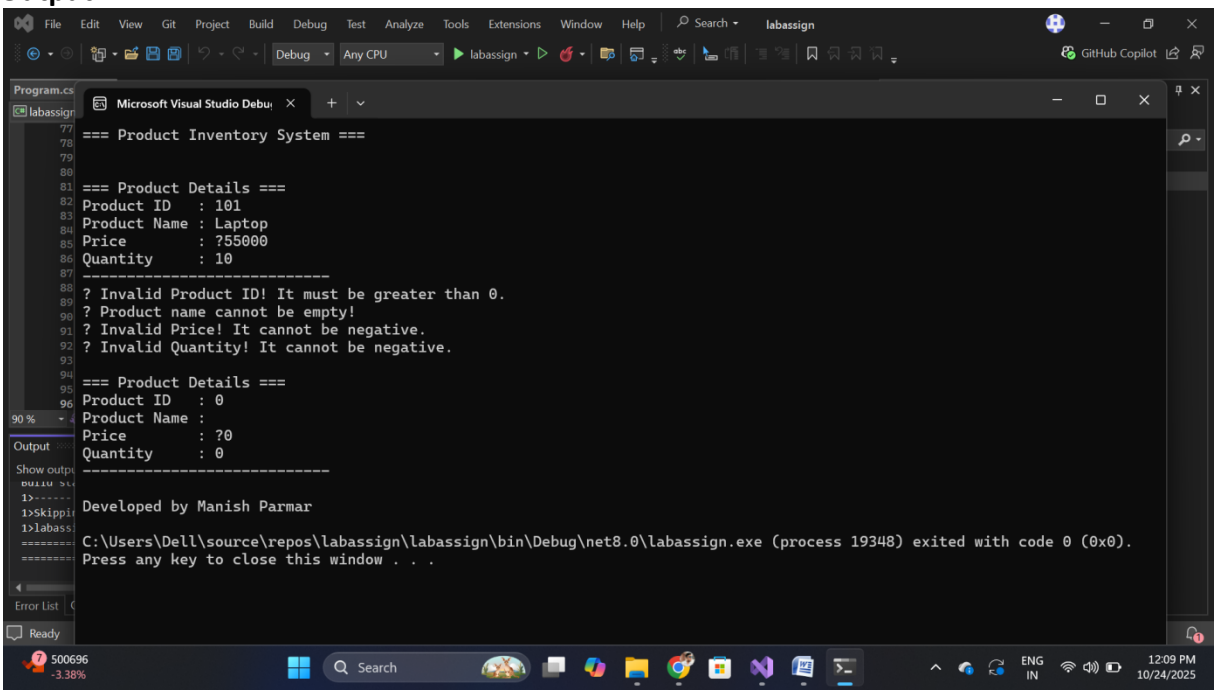
Ans 6.

```
using System;

namespace LabAssignment2
{
    class flroduct
    {

        private int productID;
        private string productName;
        private double price;
        private int quantity;

        public int flroductID
        {
            get { return productID; }
            set
            {
                if (value <= 0)
                    Console.WriteLine("❌ flroduct ID must be greater than
zero.");
                else
                    productID = value;
            }
        }

        public string flroductName
```

```
    {
        get { return productName; }
        set
        {
            if (string.IsNullOrWhiteSpace(value))
                Console.WriteLine("❌ flroduct Name cannot be empty.");
            else
                productName = value;
        }
    }

    public double flrice
    {
        get { return price; }
        set
        {
            if (value < 0)
                Console.WriteLine("❌ flrice cannot be negative.");
            else
                price = value;
        }
    }

    public int Quantity
    {
        get { return quantity; }
        set
        {
            if (value < 0)
                Console.WriteLine("❌ Quantity cannot be negative.");
            else
                quantity = value;
        }
    }

    public void Displayflroduct()
    {
        Console.WriteLine("\n=== flRODUCT DETAILS ===");
        Console.WriteLine($"flroduct ID : {flroductID}");
        Console.WriteLine($"flroduct Name : {flroductName}");
        Console.WriteLine($"flrice       : ${flrice}");
        Console.WriteLine($"Quantity   : {Quantity}");
        Console.WriteLine(new string('-', 30));
    }
}

class  flrogram
{
    static void Main(string[] args)
    {
        Console.WriteLine("=== INVENTORY SYSTEM ===\n");


        flroduct product1 = new flroduct
        {
            flroductID = 101,
            flroductName = "Laptop",
            flrice = 1200.50,
            Quantity = 10
        };
```

```
            flroduct product2 = new flroduct
            {
                flroductID = -5,
                flroductName = "",
                flrice = -50,
                Quantity = -3
            };


            Console.WriteLine("flroduct 1 (Valid):");
            product1.Displayflroduct();

            Console.WriteLine("flroduct 2 (Invalid):");
            product2.Displayflroduct();

            Console.WriteLine("flrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
        }
    }
}
```

Output:



Q 7. Design a basic Library Management System using OOP concepts.

- Classes: Book, Member, Library
- Implement:
    - Book lending feature
    - Member registration
    - Track available books
- Use concepts like inheritance, encapsulation, and method overriding wherever suitable.

Ans 7.

```
using System;
using System.Collections.Generic;

namespace LabAssignment2
{
    class Book
    {
        public int BookID { get; private set; }
        public string Title { get; private set; }
        public string Author { get; private set; }
        public bool IsAvailable { get; private set; }

        public Book(int bookID, string title, string author)
        {
            BookID = bookID;
            Title = title;
            Author = author;
            IsAvailable = true;
        }

        public void Borrow()
        {
            if (IsAvailable)
            {
                IsAvailable = false;
                Console.WriteLine($"✅ '{Title}' has been borrowed.");
            }
            else
            {
                Console.WriteLine($"❌ '{Title}' is currently not available.");
            }
        }


        public void ReturnBook()
        {
            IsAvailable = true;
            Console.WriteLine($"☎ '{Title}' has been returned and is now
available.");
        }

        public virtual void DisplayInfo()
        {
            Console.WriteLine($"[{BookID}] {Title} by {Author} - {(IsAvailable o
"Available" : "Borrowed")}");
        }
    }

    class Member
    {
        public int MemberID { get; private set; }
        public string Name { get; private set; }
        public List<Book> BorrowedBooks { get; private set; }

        public Member(int memberID, string name)
        {
            MemberID = memberID;
            Name = name;
            BorrowedBooks = new List<Book>();
        }
```

```
        public void BorrowBook(Book book)
        {
            if (book == null)
            {
                Console.WriteLine("❌ Invalid book.");
                return;
            }

            if (book.IsAvailable)
            {
                book.Borrow();
                BorrowedBooks.Add(book);
            }
            else
            {
                Console.WriteLine($"❌ '{book.Title}' is not available for
borrowing.");
            }
        }


        public void ReturnBook(Book book)
        {
            if (BorrowedBooks.Contains(book))
            {
                book.ReturnBook();
                BorrowedBooks.Remove(book);
            }
            else
            {
                Console.WriteLine($"⚠  You haven't borrowed '{book.Title}'.");
            }
        }

        public void DisplayBorrowedBooks()
        {
            Console.WriteLine($"\nBorrowed Books by {Name}:");
            if (BorrowedBooks.Count == 0)
                Console.WriteLine("No books borrowed.");
            else
                foreach (var book in BorrowedBooks)
                    Console.WriteLine($"- {book.Title}");
        }
    }


    class Library
    {
        private List<Book> books;
        private List<Member> members;

        public Library()
        {
            books = new List<Book>();
            members = new List<Member>();
        }


        public void RegisterMember(Member member)
        {
            if (member == null)
            {
```

```
            Console.WriteLine("❌ Invalid member.");
            return;
        }

        members.Add(member);
        Console.WriteLine($"👤 Member "{member.Name}" registered
successfully!");
    }

    public void AddBook(Book book)
    {
        if (book == null)
        {
            Console.WriteLine("❌ Invalid book.");
            return;
        }

        books.Add(book);
        Console.WriteLine($"📖 Book '{book.Title}' added to the library.");
    }


    public void DisplayAllBooks()
    {
        Console.WriteLine("\n=== LIBRARY BOOKS ===");
        foreach (var book in books)
        {
            book.DisplayInfo();
        }
    }


    public void DisplayAllMembers()
    {
        Console.WriteLine("\n=== REGISTERED MEMBERS ===");
        foreach (var member in members)
        {
            Console.WriteLine($"[{member.MemberID}] {member.Name}");
        }
    }
}


class  flrogram
{
    static void Main(string[] args)
    {
        Console.WriteLine("=== LIBRARY MANAGEMENT SYSTEM ===\n");


        Library library = new Library();


        Book book1 = new Book(1, "The Great Gatsby", "F. Scott Fitzgerald");
        Book book2 = new Book(2, "To Kill a Mockingbird", "Harper Lee");
        Book book3 = new Book(3, "1984", "George Orwell");

        library.AddBook(book1);
        library.AddBook(book2);
        library.AddBook(book3);
```

```
            Member member1 = new Member(101, "Alice");
            Member member2 = new Member(102, "Bob");

            library.RegisterMember(member1);
            library.RegisterMember(member2);

            library.DisplayAllBooks();
            library.DisplayAllMembers();


            Console.WriteLine("\n--- BOOK LENDING DEMO ---");
            member1.BorrowBook(book1);
            member2.BorrowBook(book1);
            member1.DisplayBorrowedBooks();
            member2.DisplayBorrowedBooks();


            Console.WriteLine("\n--- BOOK RETURN DEMO ---");
            member1.ReturnBook(book1);
            member2.BorrowBook(book1);

            library.DisplayAllBooks();

            Console.WriteLine("\nflrogram finished successfully!");
            Console.WriteLine("Developed by Manish Parmar.");
        }
    }
}
```

Output: