OOPS LAB MANUAL

Online Examination System

GROUP#7

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Object-Oriented Programming

Object-Oriented Programming Project Manual

Project Title: Online Examination System

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1. Introduction

Objective: To design and implement a console-based Online Examination System using C++ that demonstrates object-oriented programming concepts like inheritance, polymorphism, operator overloading, and file handling.

Scope: This system allows two types of users – Admin and Student. Admins can view results, while students can take a multiple-choice exam and have their results saved to a file.

2. Tools and Technologies

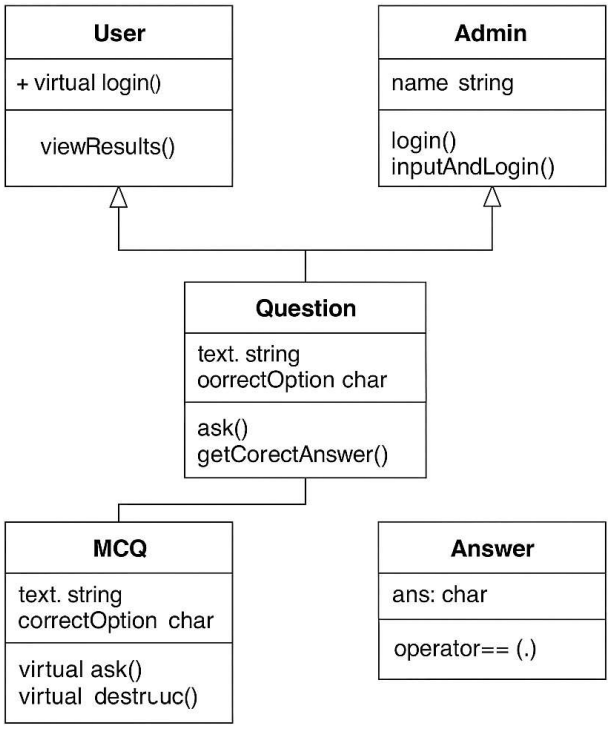
Language: C++

Compiler: g++ / Visual Studio Code with C++ extension

Concepts Used: Inheritance, Polymorphism, Operator Overloading, File Handling, Abstract Classes

3. System Design

3.1 Class Diagram



3.2 Class Descriptions

- User (Abstract Class): Contains a pure virtual login function.
- Admin: Inherits from User. Can login and view stored student results.
- Student: Inherits from User. Inputs name and attempts the quiz.
- Question (Abstract Class): Base for MCQ with virtual functions.
- MCQ: Inherits from Question, contains question text and correct answer.
- Answer: A simple class with overloaded == operator to compare answers.

3.3 Relationships

Inheritance: User → Admin, Student
Polymorphism: Question → MCQ via virtual functions
Operator Overloading: Answer class compares user answer with correct answer

4. Implementation Details

4.1 Core Functionalities

- Admin login with hardcoded credentials
- Student login with name input
- Quiz system with multiple MCQs
- Result calculation and display
- Result saved to a text file

4.2 Sample Code Snippet

```
Answer(char a) : ans(toupper(a)) {}
bool operator==(const Answer &other) {
   return ans == other.ans;
}
```

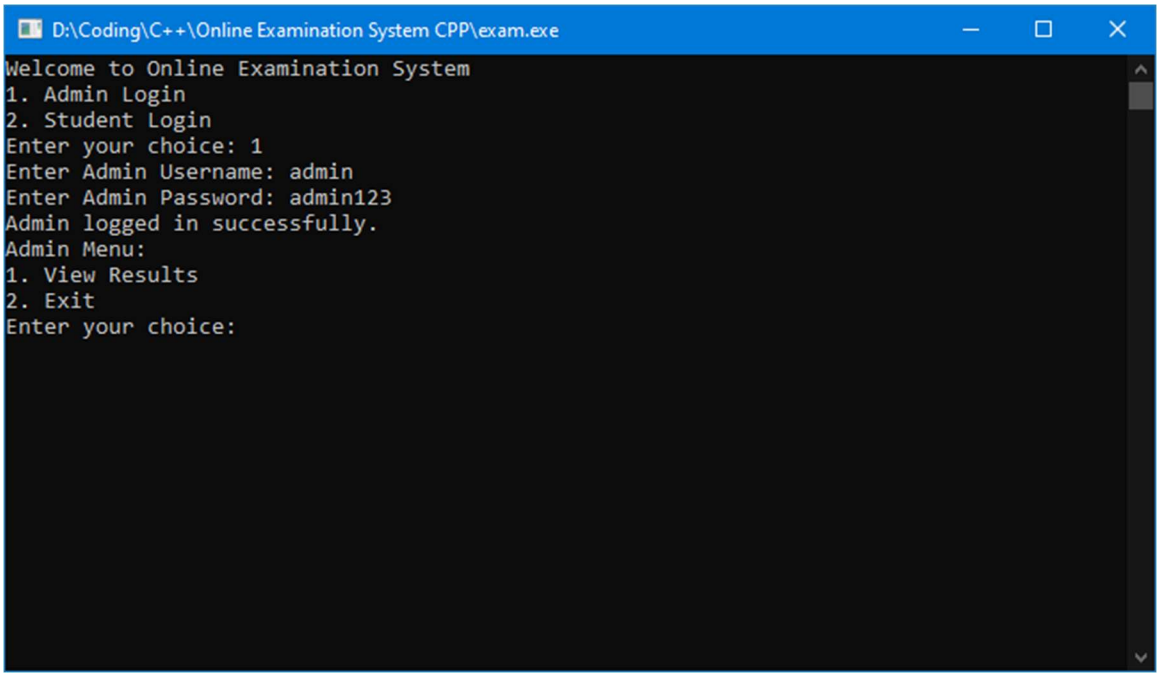
5. File Handling

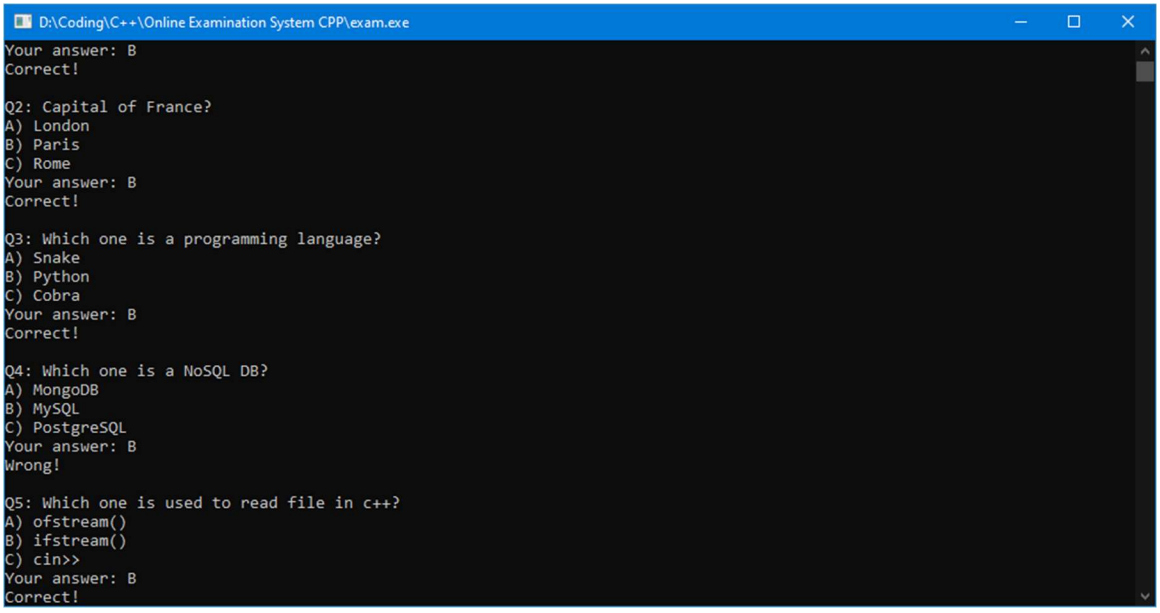
The file '*data/score.txt*' is used to append student results.
Results are written in the following format:
Student: [Name]
Score: X out of Y.

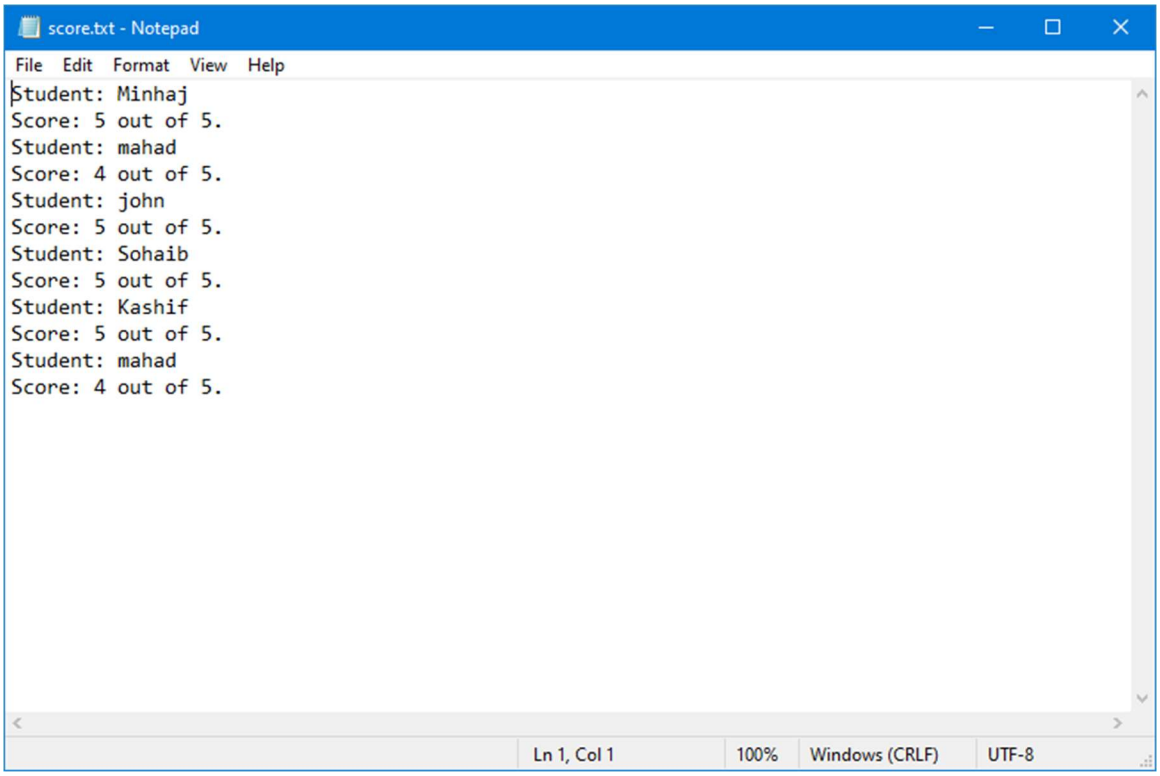
6. Testing and Output

- Sample Inputs:
  Admin login: admin/admin123
  Student Name: Ali Raza

- Sample Outputs and Screenshots:


D:\Coding\C++\Online Examination System CPP\exam.exe
Welcome to Online Examination System
1. Admin Login
2. Student Login
Enter your choice: 1
Enter Admin Username: admin
Enter Admin Password: admin123
Admin logged in successfully.
Admin Menu:
1. View Results
2. Exit
Enter your choice:


D:\Coding\C++\Online Examination System CPP\exam.exe
Your answer: B
Correct!
Q2: Capital of France?
A) London
B) Paris
C) Rome
Your answer: B
Correct!
Q3: Which one is a programming language?
A) Snake
B) Python
C) Cobra
Your answer: B
Correct!
Q4: Which one is a NoSQL DB?
A) MongoDB
B) MySQL
C) PostgreSQL
Your answer: B
Wrong!
Q5: Which one is used to read file in c++?
A) ofstream()
B) ifstream()
C) cin>>
Your answer: B
Correct!



7. Results

- Student name is accepted properly using getline
- Quiz results are calculated correctly
- Results are saved in file and viewable by admin
- Code follows OOP concepts successfully

8. Limitations

- Console-based UI
- Hardcoded admin login
- No persistent student data storage
- Text file-based result management
- No retry attempts or question randomization

9. Future Enhancements

- Add GUI using Qt or C++/CLI
- Store questions and user data in SQLite or MySQL
- Add authentication for each student
- Implement question shuffling or multiple exam sets

10. Conclusion

This project helped reinforce object-oriented programming principles like inheritance, polymorphism, and operator overloading. File handling allowed for basic persistent storage. The Online Examination System demonstrates the ability to design and implement modular, scalable applications in C++.

11. References

- https://www.geeksforgeeks.org/
- C++ Object-Oriented Programming notes
- Our repo: https://github.com/dopescripts/Online-Examination-System-CPP

12. Appendices

Source Code: https://github.com/dopescripts/Online-Examination-System-CPP

```cpp
#include <iostream>

#include <fstream>
#include <vector>
#include <string>
#include <cctype> // for toupper()

using namespace std;

// Abstract Base Class
class User
{
public:
    virtual void login() = 0; // pure virtual function
};

// Admin Class
class Admin : public User
{
public:
    void login() override
    {
        string username, password;
        cout << "Enter Admin Username: ";
        cin >> username;
        cout << "Enter Admin Password: ";
        cin >> password;

        if (username == "admin" && password == "admin123")
```

```
        {
            cout << "Admin logged in successfully." << endl;
        }
        else
        {
            cout << "Invalid username or password" << endl;
            return; // Exit program if login fails
        }
    }
    void viewResults()
    {
        ifstream inFile("data/score.txt");
        if (!inFile)
        {
            cerr << "Error opening file for reading." << endl;
            return;
        }
        string line;
        cout << "Results:\n";
        while (getline(inFile, line, '.'))
        {
            cout << line << endl;
            cout << "--------------------" << endl;
        }
    }
};

// Student Class
class Student : public User
{
public:
    string name;
    Student() {}
    Student(string n) : name(n) {}
    void login() override
    {
        cout << "Student " << name << " logged in.\n";
    }
    void inputAndLogin()
    {
        cout << "Enter your name (single word): ";
        cin.ignore();
        getline(cin, name); // Use getline to allow spaces
        login();
    }
```

```
};

// Abstract Base Question Class
class Question
{
public:
    virtual void ask() = 0;
    virtual char getCorrectAnswer() = 0;
    virtual ~Question() {} // Virtual destructor
};

// MCQ Class, Derived from Question
class MCQ : public Question
{
    string text;
    char correctOption;

public:
    MCQ(string t, char c) : text(t), correctOption(toupper(c)) {} //
constructor
    void ask() override
    {
        cout << text << endl;
    }
    char getCorrectAnswer() override
    {
        return correctOption;
    }
};

// Answer Class with Operator Overloading
class Answer
{
    char ans;

public:
    Answer(char a) : ans(toupper(a)) {}
    bool operator==(const Answer &other)
    {
        return ans == other.ans;
    }
};

int main()
{
```

```
    Student s;
    int user;
    cout << "Welcome to Online Examination System" << endl;
    cout << "1. Admin Login\n2. Student Login\nEnter your choice: ";
    cin >> user;

    if (user == 1)
    {
        Admin admin;
        admin.login();
        cout << "Admin Menu:\n";
        cout << "1. View Results\n2. Exit\nEnter your choice: ";
        int choice;
        cin >> choice;
        if (choice == 1)
        {
            admin.viewResults();
            system("pause");
        }
        else
        {
            cout << "Exiting...\n";
            return 0;
        }
        return 0;
    }
    else if (user == 2)
    {
        // Student Login
        s.inputAndLogin();
    }
    else
    {
        cout << "Invalid choice!" << endl;
    }
    // Creating the quiz (MCQs only)
    vector<Question *> quiz;
    // push_back for Output
    quiz.push_back(new MCQ("Q1: What is 2 + 2?\nA) 3\nB) 4\nC) 5", 'B'));
    quiz.push_back(new MCQ("Q2: Capital of France?\nA) London\nB)
Paris\nC) Rome", 'B'));
    quiz.push_back(new MCQ("Q3: Which one is a programming language?\nA)
Snake\nB) Python\nC) Cobra", 'B'));
    quiz.push_back(new MCQ("Q4: Which one is a NoSQL DB?\nA) MongoDB\nB)
MySQL\nC) PostgreSQL", 'A'));
```

```
    quiz.push_back(new MCQ("Q5: Which one is used to read file in c++?\nA) ofstream()\nB) ifstream()\nC) cin>>", 'B'));

    // Start the quiz
    cout << "Starting the quiz...\n";
    cout << "Please answer with A, B or C.\nReady?";
    system("pause");
    char userInput;
    int score = 0;

    for (auto q : quiz)
    {
        q->ask();
        cout << "Your answer: ";
        cin >> userInput;

        Answer userAns(userInput);
        Answer correctAns(q->getCorrectAnswer());

        if (userAns == correctAns)
        {
            cout << "Correct!\n\n";
            score++;
        }
        else
        {
            cout << "Wrong!\n\n";
        }
    }

    // Save result to file
    ofstream outFile("data/score.txt", ios::app);
    if (!outFile)
    {
        cerr << "Error opening file for writing." << endl;
        return 1;
    }
    outFile << "Student: " << s.name << endl;
    outFile << "Score: " << score << " out of " << quiz.size() << "." << endl;
    outFile.close();
    cout << "Your score: " << score << " out of " << quiz.size() << endl;
    cout << "Your score has been saved! Thank you\n";

    // Free memory because we use new
```

```
    for (auto q : quiz)
    {
        delete q;
    }
    system("pause");
    cout << "Exiting...\n";
    return 0;
}
```

Screenshots: