BACSE101 Problem Solving using Python

PROJECT REPORT

on

UNIVERSITY/EXAMINATION PORTAL ADMIN/CLIENT ACCESS MANAGEMENT

Prepared by

Atharv Poundrik – 25BCE0948
Dhruv Mohan Parab – 25BCE0950
Vrushabh Vasudev Parab – 25BCE0906
LV Ram Charitesh -25BCE0949

Under the supervision of

Prof. Padma Priya R

School of Computer Science and Engineering
Vellore Institute of Technology, Vellore.

November 07, 2025

Table of Contents

Abstract

1. Introduction

2. Problem Statement and Objectives

3. Implementation Code

4. Demo Screenshots

5. Important Links

6. Conclusion

Abstract

This project is a ***command-line Examination Portal*** *built using* ***Python****. It uses* ***Role-Based Access Control (RBAC)*** *to manage university examination records securely. The system has two types of users* ***students*** *and* ***faculty*** *each with specific permissions.*

- ***Students*** *can log in to view their own academic details, such as General Management Scores, Domain-Specific Scores, total percentage, and remarks. However, they* ***cannot change or edit*** *any data.*
- ***Faculty members*** *have full administrative access. They can* ***add new student records****,* ***update marks****,* ***assign remarks****,* ***delete profiles****, and* ***sort the student database****.*

By separating user roles and permissions, the portal ensures ***data security, accuracy, and integrity****. This makes it a reliable and scalable solution for managing sensitive examination data within an academic institution.*

1. Introduction

Managing academic records especially examination results requires both efficiency and strong data security. Traditional systems often fail to control access properly, leading to risks like unauthorized data changes or leaks. This project presents the **Examination Portal**, a Python-based system that uses **Role-Based Access Control (RBAC)** to securely manage academic information. It creates a clear two-level structure: **students** can only log in to view their own scores and remarks, while **faculty members** have full administrative access to update marks, manage student data, and organize records. By clearly defining what each user can and cannot do, the system prevents data misuse, simplifies administration, and ensures a safe, reliable, and modern solution for handling academic records.

1.1 Domain Information

The project belongs to the **Education Management System** domain, focusing on **university examination administration**. It addresses the management of student academic records and result processing through a secure and efficient **Role-Based Access Control (RBAC)** model. This domain emphasizes **data security, user authentication, and academic record management** within an institutional environment.

1.2 Software Libraries Used

The software libraries used are pandas, time and sqlite3.

1.3 Contributions by Team Members

The project's code contributions were divided as follows: **Atharv Poundrik** focused on the **pandas** integration, **LV Ram Charitesh** has focused on the data collection and its management and menu implementation while **Dhruv Mohan Parab** and **Vrushabh Vasudev Parab** handled the **SQL** aspects. Furthermore, every team member played a part in developing the **core pure Python** code.

1.4 Challenges Faced

Since performing CRUD operations directly in Pandas became complex and inefficient for managing large datasets, we integrated SQL-based CRUD commands within the Pandas workflow to simplify data manipulation and improve clarity.

2. Problem Statement and Objectives

Problem Statement:

Managing sensitive university examination data through traditional or unsecured systems presents significant risks, primarily **unauthorized access, data tampering, and a lack of accountability**. Specifically, a unified access system grants students the potential to manipulate their own scores, and faculty members may struggle to efficiently update, track, and secure large volumes of records without a clear administrative interface. The core problem is the need for an **efficient, secure, and role-segregated system** to manage student academic performance data, ensuring that students can only view their information while providing faculty with robust, reliable tools for comprehensive data management (Create, Read, Update, Delete).

Project Objectives:

The primary goal of this project is to develop a command-line Examination Portal using Python and Role-Based Access Control (RBAC) to securely manage university examination records. The specific objectives are:

1. **Develop a Secure Authentication System:** To implement a robust login mechanism that authenticates users and assigns roles (Student or Faculty) to enforce appropriate access controls.
2. **Segregate User Permissions (RBAC):** To ensure a strict separation of duties where:
   - **Students** are restricted to **Read-Only** access, allowing them to view their specific General Management Scores, Domain-Specific Scores, total percentage, and remarks.
   - **Faculty** are granted **Full Administrative (CRUD)** permissions to add new student records, update existing marks, assign remarks, delete student profiles, and sort the database.
3. **Implement CRUD Functionality for Faculty:** To provide faculty members with a comprehensive menu-driven interface to perform the following operations efficiently on the student data: **Create** (add new records), **Read** (view all records), **Update** (modify scores and remarks), and **Delete** (remove profiles).
4. **Ensure Data Integrity and Accuracy:** To utilize structured data management (using Pandas and integrated SQL logic) to maintain consistency and accuracy in all academic records and ensure all calculated metrics, like total percentage, are correctly derived.
5. **Deliver a User-Friendly Console Interface:** To design a clear, intuitive command-line interface that allows both faculty and students to navigate the system and access features with ease.

3. Implementation

3.1 Main Menu and Role Selection

The main function (main()) presents the initial menu to the user, allowing them to select their role (Student or Faculty) before logging in. This is the entry point for the RBAC system.

Option	**Description**	**Access Role**
1	Student Login	Student
2	Faculty Login	Faculty
3	Exit	General

Code:

```
def main():
    while True:
        print("\n--- Examination Portal ---")
        print("1. Student Login")
        print("2. Faculty Login")
        print("3. Exit")
        choice = input("Enter Choice: ")
        if choice == '1':
            student_login()
        elif choice == '2':
            faculty_login()
        elif choice == '3':
            break
        else:
            print("Invalid Choice!")


main()
```

3.2 Student Read-Only Access

The student_login() function implements the **Read-Only** access restriction for students. After successful authentication against the student_data.csv file, a student can only view their own academic details , ensuring data security.

Student Features Menu:

1.Show Marks: Displays General Management Score, Domain-Specific Score, Total Score, and Percentage.
2.Show Remarks: Displays the assigned remark for the student.
3.Logout

Code:

```
def student_login():
    df = pd.read_csv("student_data.csv")
    print("----STUDENT LOGIN----")
    loginId = input("Enter your loginId: ")
    password = input("Enter password: ")
    student = df[(df["Login_IDs"] == loginId) & (df["PASSWORDS"] == password)]
    student = student.reset_index()
    if student.empty:
        print("Invalid Credentials. Try Again!")
        return
    print("Loading....")
    time.sleep(1)
    print(f"Welcome!! {student.loc[0]["NAME_OF_THE_STUDENT"]}")
    while True:
        print("1. Show Marks")
        print("2. Show Remarks")
        print("3. Logout")
        choice = int(input("Enter choice: "))
        time.sleep(0.5)
        if choice == 1:
            print("Loading....")
            print("1. General Management Score (OUT of 50)")
            print("2. Domain Specific Score (OUT of 50)")
            print("3. Total Score and Percentage")
            choice1 = int(input("Enter your choice: "))
            gms = student.loc[0]["GENERAL_MANAGEMENT_SCORE_OUT_of_50"]
            dss = student.loc[0]["DOMAIN_SPECIFIC_SCORE_OUT_50"]
            if choice1 == 1:
                print("Loading....")
                time.sleep(0.5)
                print("Your score is:",gms)
            elif choice1 == 2:
                print("Loading....")
                time.sleep(0.5)
                print("Your score is:",dss)
            elif choice1 == 3:
                print("Loading....")
                time.sleep(0.5)
                totalScore = gms + dss
                print("Your Total Score:",totalScore)
                percentage = (totalScore/100) * 100
                percentage = round(percentage)
                print("Percentage obtained:",percentage,"%")
            else:
                print("Invalid choice!")
        elif choice == 2:
            print("Loading....")
            time.sleep(0.5)
            print(student.loc[0]["REMARKS"])
        elif choice == 3:
            print("Logging out...")
            time.sleep(0.5)
            break
        else:
            print("Invalid Choice")
```

3.3 Faculty Administrative Access (CRUD Operations)

The faculty_login() function provides **Full Administrative (CRUD)** permissions to faculty members. It uses both **pandas** for immediate data manipulation and a seamless **sqlite3** integration to manage the student database, simplifying complex operations. The faculty's CSV data is used for authentication against their login ID and password.

Faculty Features Menu:

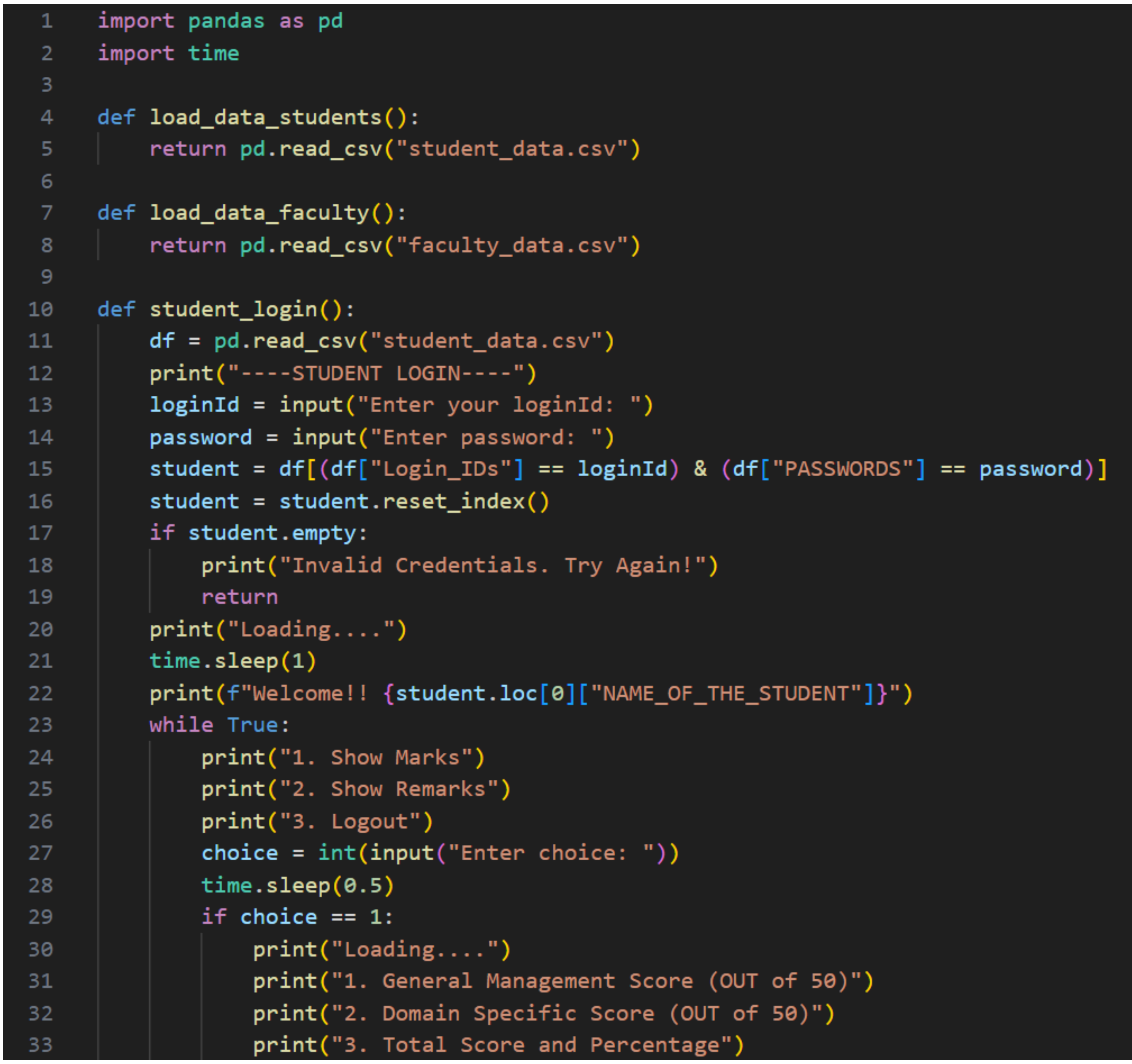
1.Upload/Update Student Marks: Allows updating General Management Score, Domain-Specific Score, and Remarks for an existing student (an **Update** operation).
2.Sort Students (SQL): Allows sorting the student database by various columns like Name, Total Score, etc.
3.Add Student (SQL): Allows creating and adding a new student record to the database (a **Create** operation).
4.Remove Student (SQL): Allows deleting a student profile from the database (a **Delete** operation).
5.Logout

Code:

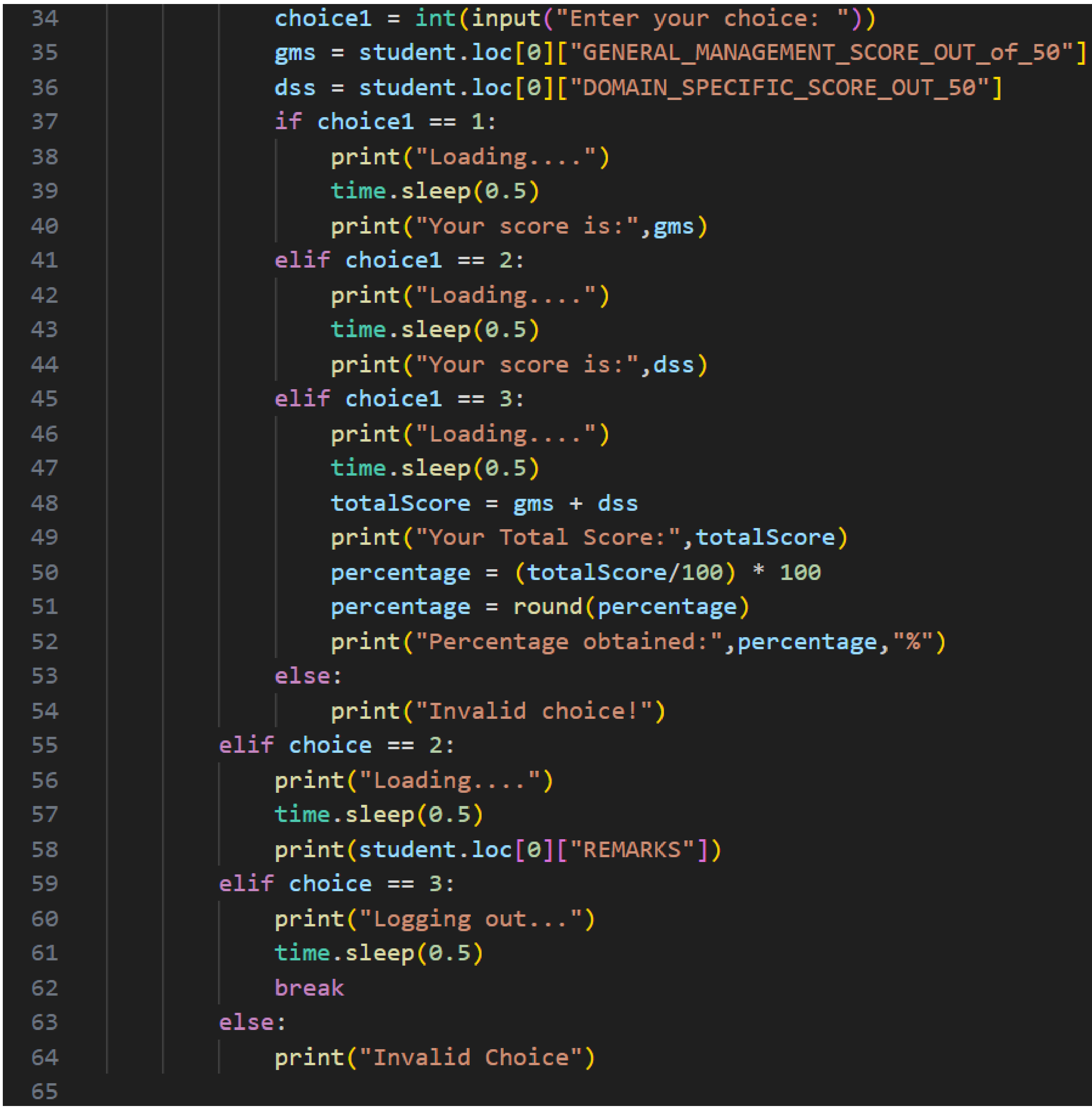
```
def faculty_login():
    import sqlite3
    df1 = pd.read_csv("student_data.csv")
    df2 = pd.read_csv("faculty_data.csv")

    print("----FACULTY LOGIN----")
    t_id = input("Enter login ID: ")
    password = input("Enter password: ")
    faculty = df2[(df2["LoginID"] == t_id) & (df2["password"] == password)]
    faculty = faculty.reset_index()

    if faculty.empty:
        print("Invalid credentials. Try again")
        return

    print("Loading....")
    time.sleep(1)
    print(f"Welcome!! {faculty.iloc[0]['Name']}")

    conn = sqlite3.connect("examination.db")
    cur = conn.cursor()

    df1.columns = df1.columns.str.strip()
    df1.columns = df1.columns.str.replace(' ', '_')
    df1.columns = df1.columns.str.replace('[()]', '', regex=True)
    df1.to_sql("students", conn, if_exists="replace", index=False)

    while True:
        print("1. Upload/Update Student Marks")
        print("2. Sort Students (SQL)")
        print("3. Add Student (SQL)")
        print("4. Remove Student (SQL)")
        print("5. Logout")
        choice = int(input("Enter your choice: "))
    if choice == 1:
        student_id = input("Enter student ID: ")
        print("Loading....")
        time.sleep(0.5)
        if student_id not in list(df1["Login_IDs"]):
            print("Student not found")
        else:
            print(f"Update marks of {df1.loc[df1['Login_IDs'] == student_id,
'NAME_OF_THE_STUDENT'].values[0]}")
            gms = float(input("Enter General Management Score (OUT of 50): "))
            dss = float(input("Enter Domain Specific Score (OUT of 50): "))
            remark = input("Enter remark: ")
            total = gms + dss
            df1.loc[df1['Login_IDs'] == student_id,
'GENERAL_MANAGEMENT_SCORE_OUT_of_50'] = gms
            df1.loc[df1['Login_IDs'] == student_id, 'DOMAIN_SPECIFIC_SCORE_OUT_50'] = dss
            df1.loc[df1['Login_IDs'] == student_id, 'TOTAL_SCORE_OUT_of_100'] = total
            df1.loc[df1['Login_IDs'] == student_id, 'REMARKS'] = remark
            df1.to_csv("student_data.csv", index=False)

            df1.to_sql("students", conn, if_exists="replace", index=False)
            print("Marks/Remark updated successfully!")

    elif choice == 2:
        print("\n--- Sort Students (SQL) ---")
        print("1. By Name")
        print("2. By Total Score")
        print("3. By General Management Score")
        print("4. By Domain Specific Score")
        sort_choice = int(input("Enter your choice: "))
        if sort_choice == 1:
            query = "SELECT * FROM students ORDER BY `NAME_OF_THE_STUDENT` ASC"
        elif sort_choice == 2:
            query = "SELECT * FROM students ORDER BY `TOTAL_SCORE_OUT_of_100`
DESC"
        elif sort_choice == 3:
            query = "SELECT * FROM students ORDER BY
`GENERAL_MANAGEMENT_SCORE_OUT_of_50` DESC"
        elif sort_choice == 4:
            query = "SELECT * FROM students ORDER BY
`DOMAIN_SPECIFIC_SCORE_OUT_50` DESC"
        else:
            print("Invalid choice!")
            continue

        sorted_df = pd.read_sql(query, conn)
        print(sorted_df[["Login_IDs", "NAME_OF_THE_STUDENT",
"TOTAL_SCORE_OUT_of_100"]])

    elif choice == 3:
        print("\n--- Add Student (SQL) ---")
        login_id = input("Enter Login ID: ")

        cur.execute("SELECT * FROM students WHERE Login_IDs = ?", (login_id,))
        existing = cur.fetchone()
        if existing:
            print("A student with this Login ID already exists. Please use a different ID.")
        else:
            password = input("Enter Password: ")
            name = input("Enter Name: ")
            gms = float(input("Enter General Management Score (OUT of 50): "))
            dss = float(input("Enter Domain Specific Score (OUT 50): "))
            total = gms + dss
            remark = input("Enter Remark: ")

            cur.execute("""
                INSERT INTO students
("Login_IDs","PASSWORDS","NAME_OF_THE_STUDENT",
                "GENERAL_MANAGEMENT_SCORE_OUT_of_50","DOMAIN_SPECIFIC_SCO
RE_OUT_50",
                "TOTAL_SCORE_OUT_of_100","REMARKS")
                VALUES (?, ?, ?, ?, ?, ?, ?)
            """, (login_id, password, name, gms, dss, total, remark))

            conn.commit()
            print("Student added successfully!")

            df1 = pd.read_sql("SELECT * FROM students", conn)
            df1.to_csv("student_data.csv", index=False)

    elif choice == 4:
        print("\n--- Remove Student (SQL) ---")
        login_id = input("Enter Student Login ID to remove: ")

        cur.execute("DELETE FROM students WHERE Login_IDs = ?", (login_id,))
        conn.commit()

        if cur.rowcount == 0:
            print("No student found with that Login ID.")
        else:
            print("Student removed successfully!")
            df1 = pd.read_sql("SELECT * FROM students", conn)
            df1.to_csv("student_data.csv", index=False)

    elif choice == 5:
        print("Logging out...\n")
        break

    else:
        print("Invalid Choice")

  conn.close()
```

4. Demo Screenshots

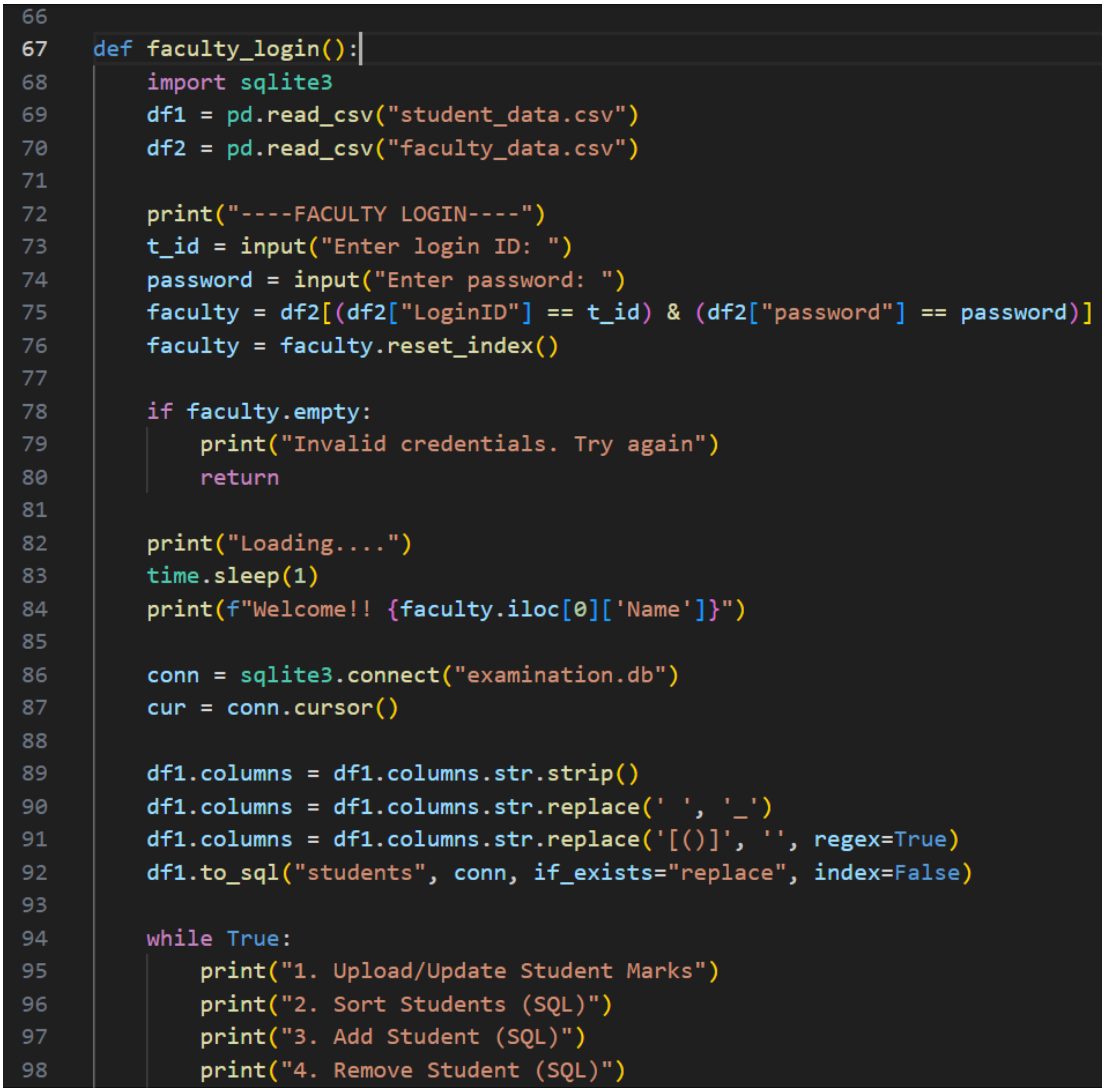
Project code screenshots:



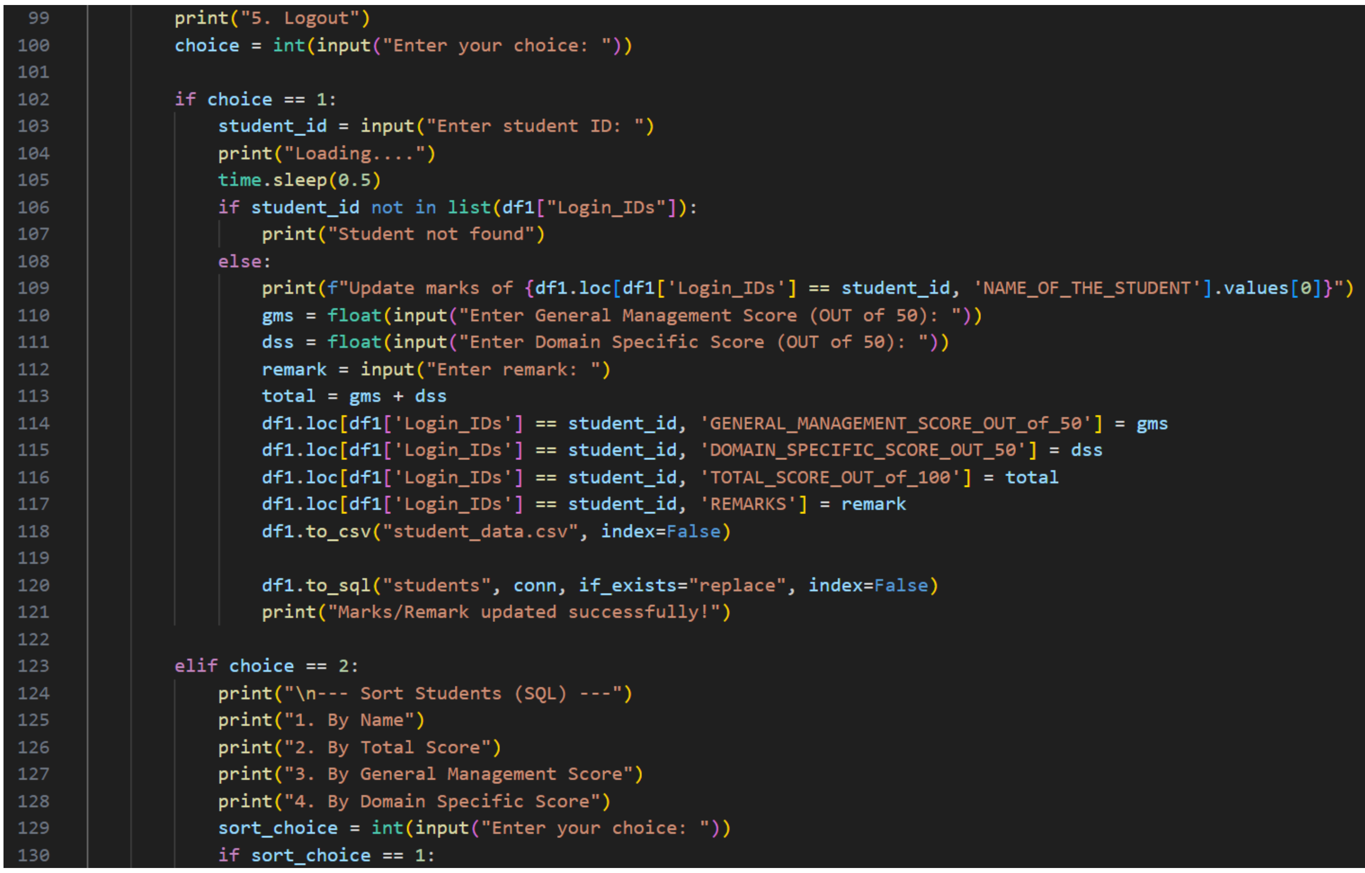
```
import pandas as pd
import time

def load_data_students():
    return pd.read_csv("student_data.csv")

def load_data_faculty():
    return pd.read_csv("faculty_data.csv")

def student_login():
    df = pd.read_csv("student_data.csv")
    print("----STUDENT LOGIN----")
    loginId = input("Enter your loginId: ")
    password = input("Enter password: ")
    student = df[(df["Login_IDs"] == loginId) & (df["PASSWORDS"] == password)]
    student = student.reset_index()
    if student.empty:
        print("Invalid Credentials. Try Again!")
        return
    print("Loading....")
    time.sleep(1)
    print(f"Welcome!! {student.loc[0]["NAME_OF_THE_STUDENT"]}")
    while True:
        print("1. Show Marks")
        print("2. Show Remarks")
        print("3. Logout")
        choice = int(input("Enter choice: "))
        time.sleep(0.5)
        if choice == 1:
            print("Loading....")
            print("1. General Management Score (OUT of 50)")
            print("2. Domain Specific Score (OUT of 50)")
            print("3. Total Score and Percentage")
```



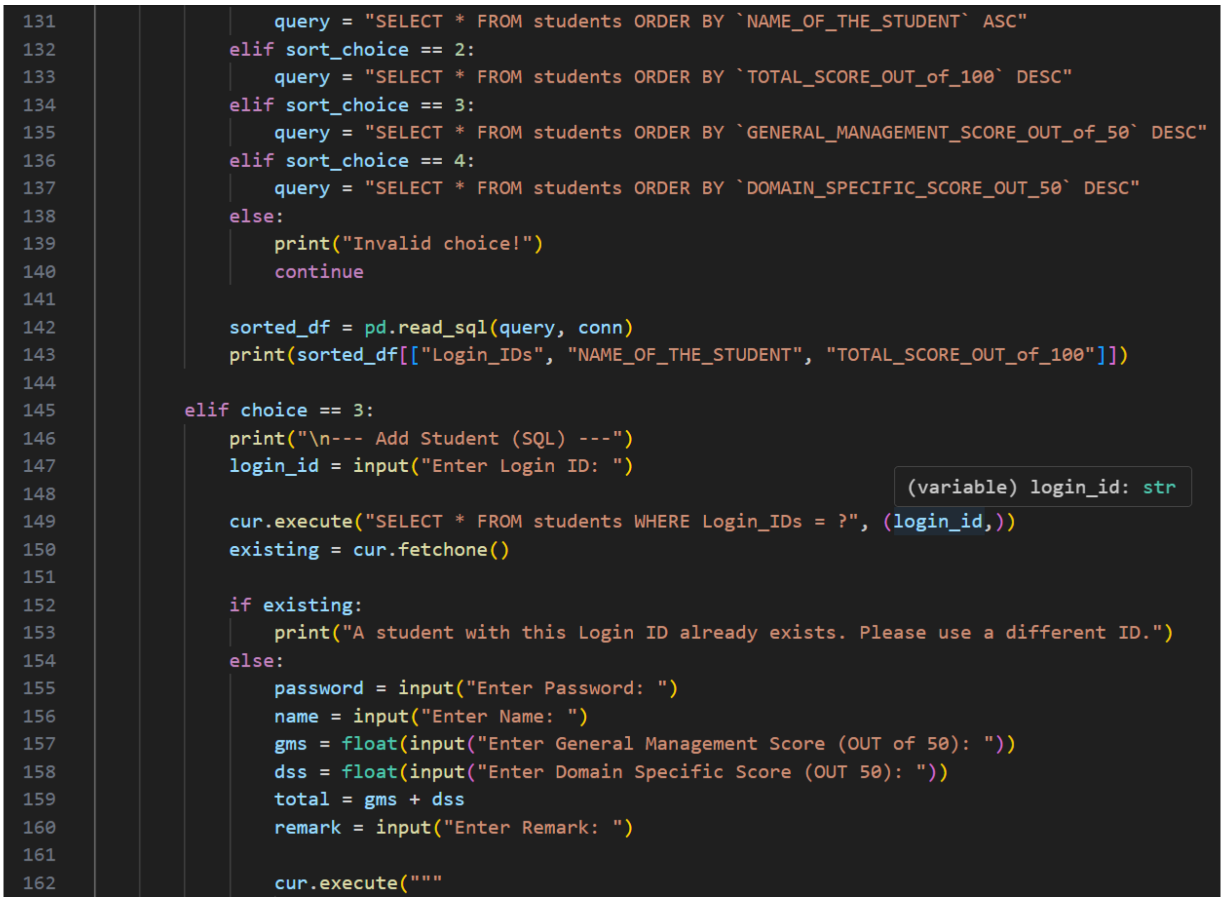
```
                choice1 = int(input("Enter your choice: "))
                gms = student.loc[0]["GENERAL_MANAGEMENT_SCORE_OUT_of_50"]
                dss = student.loc[0]["DOMAIN_SPECIFIC_SCORE_OUT_50"]
                if choice1 == 1:
                    print("Loading....")
                    time.sleep(0.5)
                    print("Your score is:",gms)
                elif choice1 == 2:
                    print("Loading....")
                    time.sleep(0.5)
                    print("Your score is:",dss)
                elif choice1 == 3:
                    print("Loading....")
                    time.sleep(0.5)
                    totalScore = gms + dss
                    print("Your Total Score:",totalScore)
                    percentage = (totalScore/100) * 100
                    percentage = round(percentage)
                    print("Percentage obtained:",percentage,"%")
                else:
                    print("Invalid choice!")
            elif choice == 2:
                print("Loading....")
                time.sleep(0.5)
                print(student.loc[0]["REMARKS"])
            elif choice == 3:
                print("Logging out...")
                time.sleep(0.5)
                break
            else:
                print("Invalid Choice")

```



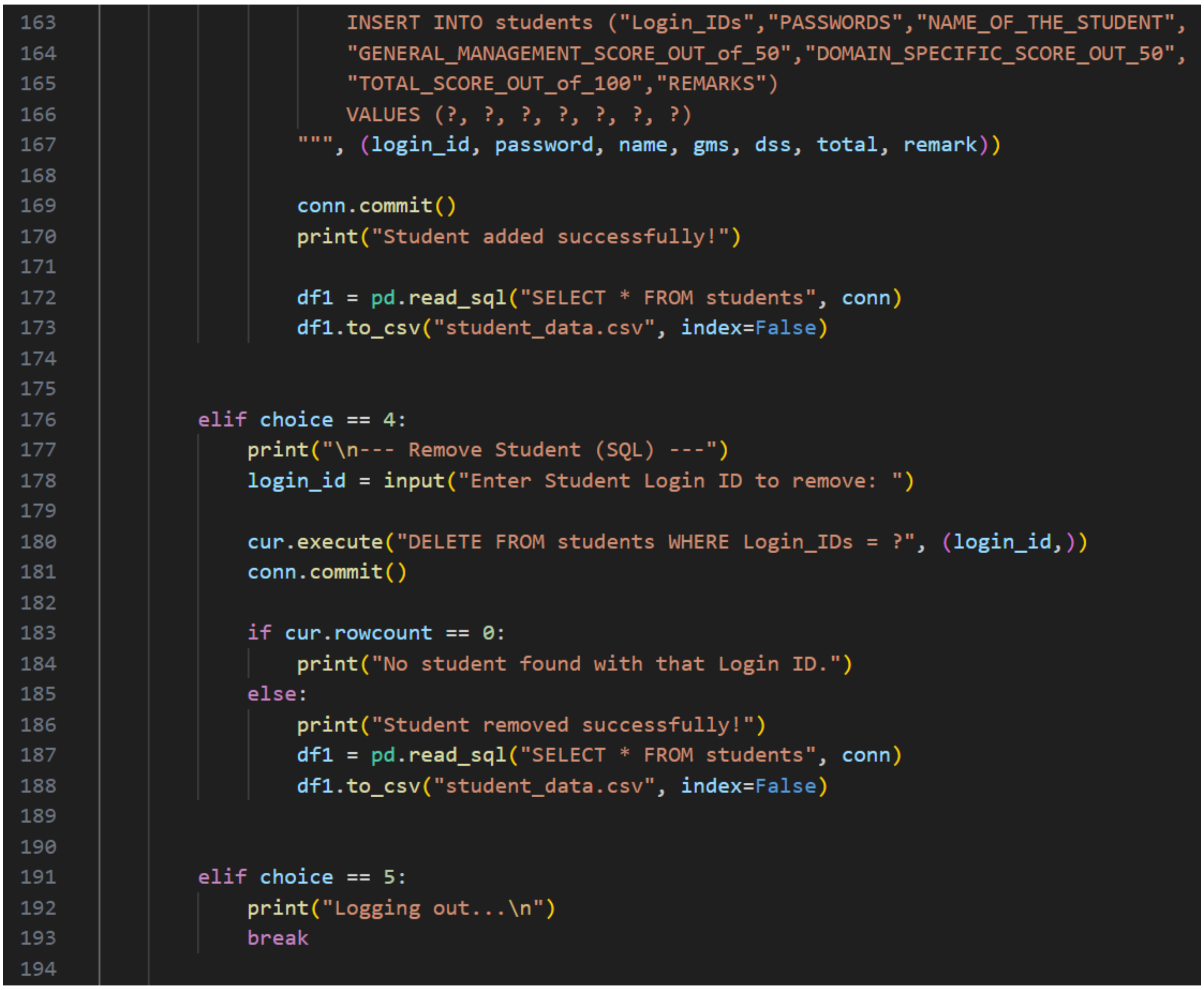
```
def faculty_login():
    import sqlite3
    df1 = pd.read_csv("student_data.csv")
    df2 = pd.read_csv("faculty_data.csv")

    print("----FACULTY LOGIN----")
    t_id = input("Enter login ID: ")
    password = input("Enter password: ")
    faculty = df2[(df2["LoginID"] == t_id) & (df2["password"] == password)]
    faculty = faculty.reset_index()

    if faculty.empty:
        print("Invalid credentials. Try again")
        return

    print("Loading....")
    time.sleep(1)
    print(f"Welcome!! {faculty.iloc[0]['Name']}")

    conn = sqlite3.connect("examination.db")
    cur = conn.cursor()

    df1.columns = df1.columns.str.strip()
    df1.columns = df1.columns.str.replace(' ', '_')
    df1.columns = df1.columns.str.replace('[()]', '', regex=True)
    df1.to_sql("students", conn, if_exists="replace", index=False)

    while True:
        print("1. Upload/Update Student Marks")
        print("2. Sort Students (SQL)")
        print("3. Add Student (SQL)")
        print("4. Remove Student (SQL)")
```



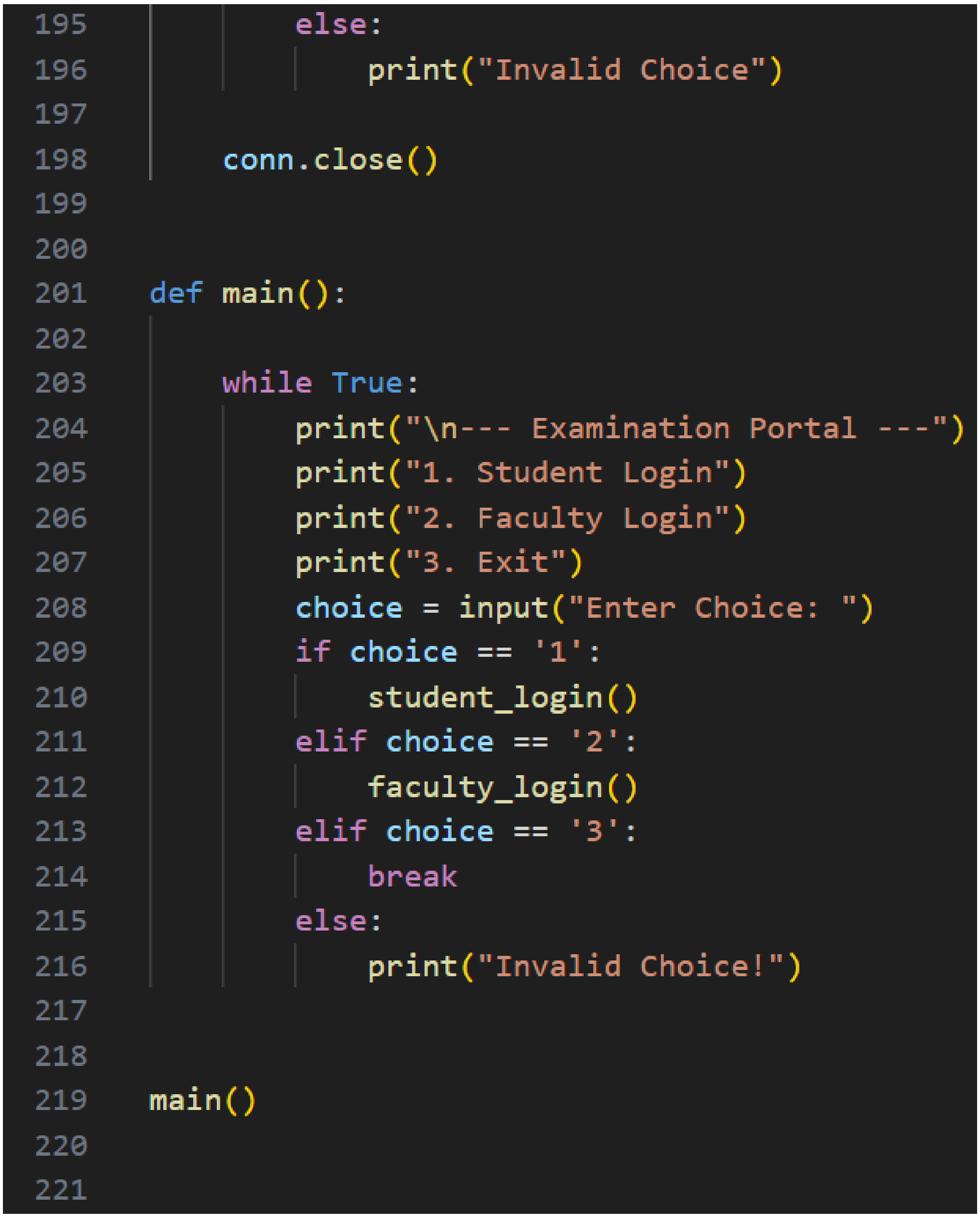
```
        print("5. Logout")
        choice = int(input("Enter your choice: "))

        if choice == 1:
            student_id = input("Enter student ID: ")
            print("Loading....")
            time.sleep(0.5)
            if student_id not in list(df1["Login_IDs"]):
                print("Student not found")
            else:
                print(f"Update marks of {df1.loc[df1['Login_IDs'] == student_id, 'NAME_OF_THE_STUDENT'].values[0]}")
                gms = float(input("Enter General Management Score (OUT of 50): "))
                dss = float(input("Enter Domain Specific Score (OUT of 50): "))
                remark = input("Enter remark: ")
                total = gms + dss
                df1.loc[df1['Login_IDs'] == student_id, 'GENERAL_MANAGEMENT_SCORE_OUT_of_50'] = gms
                df1.loc[df1['Login_IDs'] == student_id, 'DOMAIN_SPECIFIC_SCORE_OUT_50'] = dss
                df1.loc[df1['Login_IDs'] == student_id, 'TOTAL_SCORE_OUT_of_100'] = total
                df1.loc[df1['Login_IDs'] == student_id, 'REMARKS'] = remark
                df1.to_csv("student_data.csv", index=False)

                df1.to_sql("students", conn, if_exists="replace", index=False)
                print("Marks/Remark updated successfully!")

        elif choice == 2:
            print("\n--- Sort Students (SQL) ---")
            print("1. By Name")
            print("2. By Total Score")
            print("3. By General Management Score")
            print("4. By Domain Specific Score")
            sort_choice = int(input("Enter your choice: "))
            if sort_choice == 1:
```



```
                query = "SELECT * FROM students ORDER BY `NAME_OF_THE_STUDENT` ASC"
            elif sort_choice == 2:
                query = "SELECT * FROM students ORDER BY `TOTAL_SCORE_OUT_of_100` DESC"
            elif sort_choice == 3:
                query = "SELECT * FROM students ORDER BY `GENERAL_MANAGEMENT_SCORE_OUT_of_50` DESC"
            elif sort_choice == 4:
                query = "SELECT * FROM students ORDER BY `DOMAIN_SPECIFIC_SCORE_OUT_50` DESC"
            else:
                print("Invalid choice!")
                continue

            sorted_df = pd.read_sql(query, conn)
            print(sorted_df[["Login_IDs", "NAME_OF_THE_STUDENT", "TOTAL_SCORE_OUT_of_100"]])

        elif choice == 3:
            print("\n--- Add Student (SQL) ---")
            login_id = input("Enter Login ID: ")

            cur.execute("SELECT * FROM students WHERE Login_IDs = ?", (login_id,))
            existing = cur.fetchone()

            if existing:
                print("A student with this Login ID already exists. Please use a different ID.")
            else:
                password = input("Enter Password: ")
                name = input("Enter Name: ")
                gms = float(input("Enter General Management Score (OUT of 50): "))
                dss = float(input("Enter Domain Specific Score (OUT 50): "))
                total = gms + dss
                remark = input("Enter Remark: ")

                cur.execute("""
```

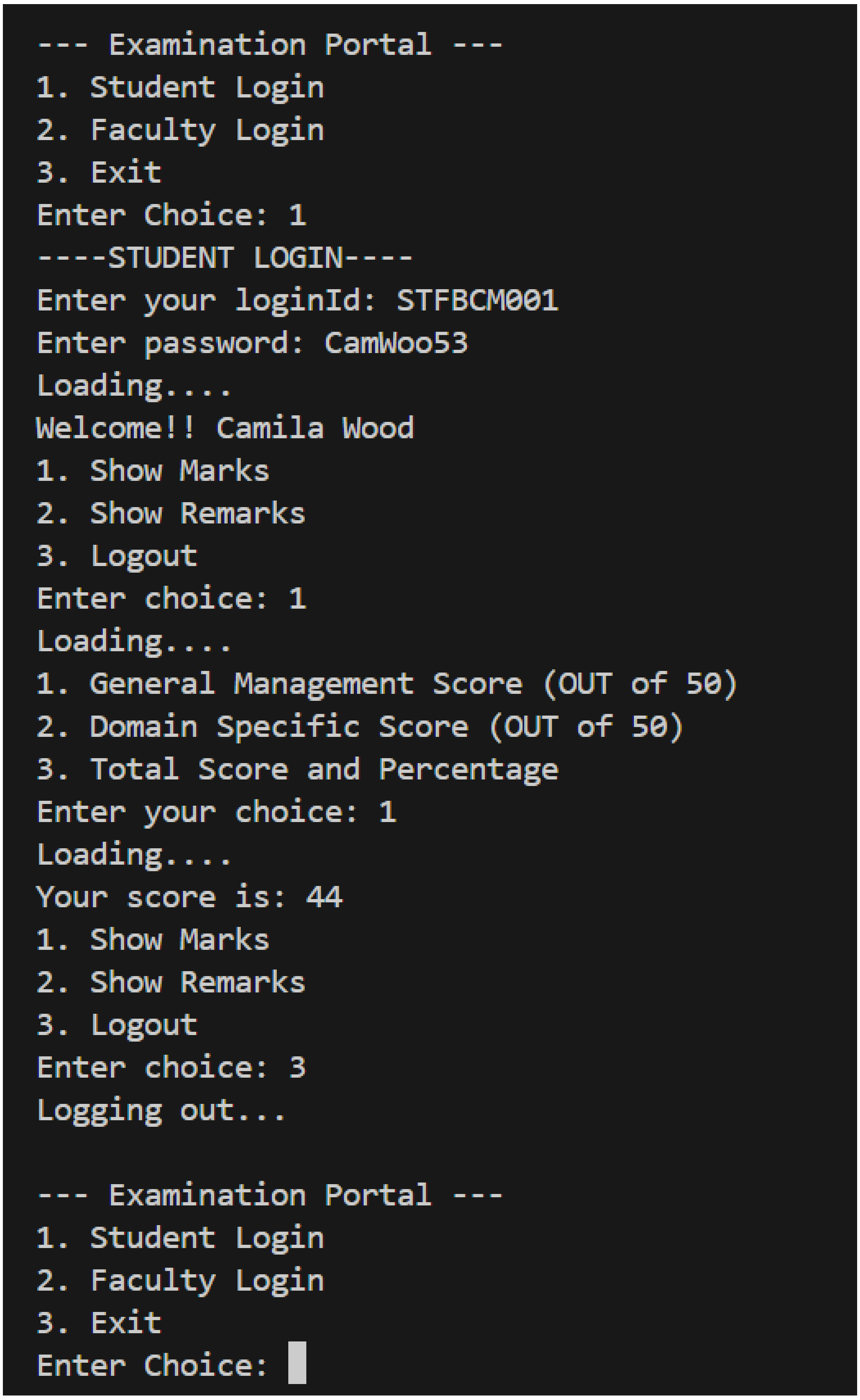


```
                    INSERT INTO students ("Login_IDs","PASSWORDS","NAME_OF_THE_STUDENT",
                    "GENERAL_MANAGEMENT_SCORE_OUT_of_50","DOMAIN_SPECIFIC_SCORE_OUT_50",
                    "TOTAL_SCORE_OUT_of_100","REMARKS")
                    VALUES (?, ?, ?, ?, ?, ?, ?)
                """, (login_id, password, name, gms, dss, total, remark))

                conn.commit()
                print("Student added successfully!")

                df1 = pd.read_sql("SELECT * FROM students", conn)
                df1.to_csv("student_data.csv", index=False)


        elif choice == 4:
            print("\n--- Remove Student (SQL) ---")
            login_id = input("Enter Student Login ID to remove: ")

            cur.execute("DELETE FROM students WHERE Login_IDs = ?", (login_id,))
            conn.commit()

            if cur.rowcount == 0:
                print("No student found with that Login ID.")
            else:
                print("Student removed successfully!")
                df1 = pd.read_sql("SELECT * FROM students", conn)
                df1.to_csv("student_data.csv", index=False)


        elif choice == 5:
            print("Logging out...\n")
            break

```



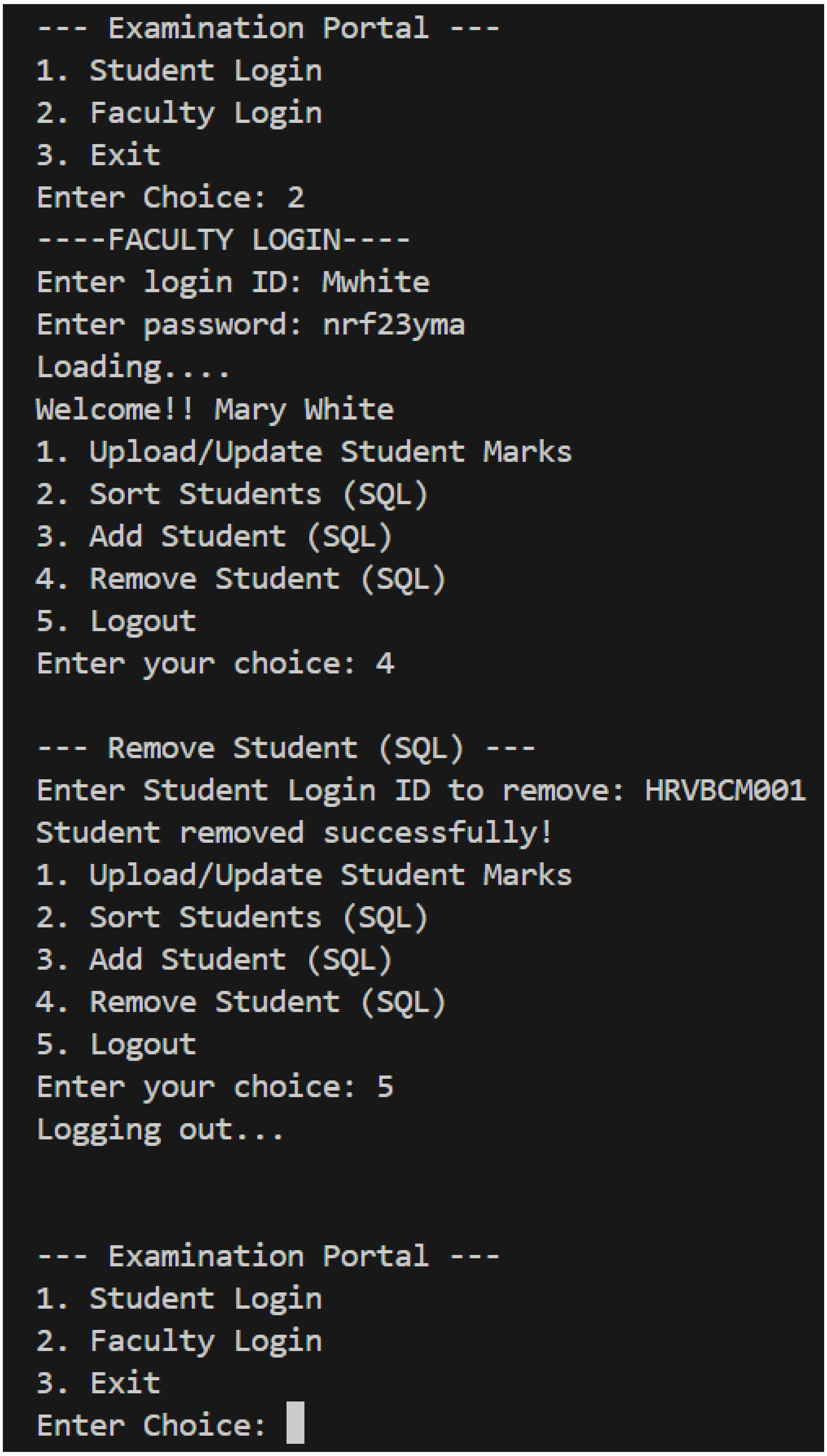
```python
        else:
            print("Invalid Choice")

    conn.close()


def main():

    while True:
        print("\n--- Examination Portal ---")
        print("1. Student Login")
        print("2. Faculty Login")
        print("3. Exit")
        choice = input("Enter Choice: ")
        if choice == '1':
            student_login()
        elif choice == '2':
            faculty_login()
        elif choice == '3':
            break
        else:
            print("Invalid Choice!")


main()
```

Demo Output(Student Login):



```
--- Examination Portal ---
1. Student Login
2. Faculty Login
3. Exit
Enter Choice: 1
----STUDENT LOGIN----
Enter your loginId: STFBCM001
Enter password: CamWoo53
Loading....
Welcome!! Camila Wood
1. Show Marks
2. Show Remarks
3. Logout
Enter choice: 1
Loading....
1. General Management Score (OUT of 50)
2. Domain Specific Score (OUT of 50)
3. Total Score and Percentage
Enter your choice: 1
Loading....
Your score is: 44
1. Show Marks
2. Show Remarks
3. Logout
Enter choice: 3
Logging out...

--- Examination Portal ---
1. Student Login
2. Faculty Login
3. Exit
Enter Choice:
```

Demo Output(Faculty Login):



```
--- Examination Portal ---
1. Student Login
2. Faculty Login
3. Exit
Enter Choice: 2
----FACULTY LOGIN----
Enter login ID: Mwhite
Enter password: nrf23yma
Loading....
Welcome!! Mary White
1. Upload/Update Student Marks
2. Sort Students (SQL)
3. Add Student (SQL)
4. Remove Student (SQL)
5. Logout
Enter your choice: 4

--- Remove Student (SQL) ---
Enter Student Login ID to remove: HRVBCM001
Student removed successfully!
1. Upload/Update Student Marks
2. Sort Students (SQL)
3. Add Student (SQL)
4. Remove Student (SQL)
5. Logout
Enter your choice: 5
Logging out...


--- Examination Portal ---
1. Student Login
2. Faculty Login
3. Exit
Enter Choice:
```

5. Important Links

KAGGLE LINK:
https://www.kaggle.com/datasets/atharvbharaskar/students-test-data

GITHUB LINK:
https://github.com/VrushabhParab/Python_Project.git

6. Conclusion

The Examination Portal successfully demonstrates a secure and efficient approach to managing university examination data using Python and Role-Based Access Control (RBAC). By clearly separating permissions between students and faculty, the system ensures data confidentiality, integrity, and accountability. Students can securely access only their own academic information, while faculty members have full administrative capabilities to manage records through intuitive CRUD operations integrated with Pandas and SQL.

The project not only highlights the importance of structured data management but also showcases how combining Python with database operations can simplify complex workflows. The system's modular design, data accuracy, and strong authentication make it a reliable solution that can be further expanded into a fully functional web or GUI-based application in the future.

Overall, the project achieves its objective of creating a scalable, user-friendly, and secure examination management system suitable for real-world educational institutions.