//Assignment 1 (b)

```
#include <iostream>
#include <cstring> // for strcmp
using namespace std;
struct Student {
    int id;
    char name[50];
    float cgpa;
};
void addStudent(Student*& students, int& count) {
    // Increase size (like realloc)
    Student* temp = new Student[count + 1];
    // Copy old data
    for (int i = 0; i < count; i++) {
        temp[i] = students[i];
    }
    // Add new student
    cout << "Enter Student ID: ";
    cin >> temp[count].id;
    cout << "Enter Student Name: ";
    cin.ignore();
    cin.getline(temp[count].name, 50);
    cout << "Enter CGPA: ";
    cin >> temp[count].cgpa;
    // Free old memory and update pointer
    delete[] students;
    students = temp;
```

```
    count++;
}
void displayStudents(Student* students, int count) {
    cout << "\n--- Student List ---\n";
    for (int i = 0; i < count; i++) {
        cout << "ID: " << students[i].id
             << ", Name: " << students[i].name
             << ", CGPA: " << students[i].cgpa << endl;
    }
}
// Bubble Sort by Name (Alphabetical)
void bubbleSortByName(Student* students, int count) {
    for (int i = 0; i < count - 1; i++) {
        for (int j = 0; j < count - i - 1; j++) {
            if (strcmp(students[j].name, students[j + 1].name) > 0) {
                swap(students[j], students[j + 1]);
            }
        }
    }
}
// Selection Sort by CGPA
void selectionSortByCGPA(Student* students, int count, bool ascending) {
    for (int i = 0; i < count - 1; i++) {
        int idx = i;
        for (int j = i + 1; j < count; j++) {
            if (ascending) {
                if (students[j].cgpa < students[idx].cgpa)
```

```
                idx = j;
            } else {
                if (students[j].cgpa > students[idx].cgpa)
                    idx = j;
            }
        }
        swap(students[i], students[idx]);
    }
}
int main() {
    Student* students = nullptr;
    int count = 0;
    int choice;
    do {
        cout << "\n=== Student Database Menu ===\n";
        cout << "1. Add Student\n";
        cout << "2. Display Students\n";
        cout << "3. Sort by Name (Bubble Sort)\n";
        cout << "4. Sort by CGPA Ascending (Selection Sort)\n";
        cout << "5. Sort by CGPA Descending (Selection Sort)\n";
        cout << "6. Exit\n";
        cout << "Enter your choice: ";
        cin >> choice;

        switch (choice) {
        case 1:
            addStudent(students, count);
```

```
            break;
        case 2:
            displayStudents(students, count);
            break;
        case 3:
            bubbleSortByName(students, count);
            cout << "Sorted by Name.\n";
            break;
        case 4:
            selectionSortByCGPA(students, count, true);
            cout << "Sorted by CGPA (Ascending).\n";
            break;
        case 5:
            selectionSortByCGPA(students, count, false);
            cout << "Sorted by CGPA (Descending).\n";
            break;
        case 6:
            cout << "Exiting...\n";
            break;
        default:
            cout << "Invalid choice!\n";
        }
    } while (choice != 6);

    delete[] students; // Free memory
    return 0;
}
```

//OUTPUT

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 1

Enter Student ID: 77

Enter Student Name: Deepak

Enter CGPA: 9.6

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 1

Enter Student ID: 14

Enter Student Name: Vipul

Enter CGPA: 8.6

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 1

Enter Student ID: 12

Enter Student Name: Sachin

Enter CGPA: 8.8

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 2

--- Student List ---

ID: 77, Name: Deepak, CGPA: 9.6

ID: 14, Name: Vipul, CGPA: 8.6

ID: 12, Name: Sachin, CGPA: 8.8

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 3

Sorted by Name.

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 2

--- Student List ---

ID: 77, Name: Deepak, CGPA: 9.6

ID: 12, Name: Sachin, CGPA: 8.8

ID: 14, Name: Vipul, CGPA: 8.6

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 4

Sorted by CGPA (Ascending).

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 2

--- Student List ---

ID: 14, Name: Vipul, CGPA: 8.6

ID: 12, Name: Sachin, CGPA: 8.8

ID: 77, Name: Deepak, CGPA: 9.6

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 5

Sorted by CGPA (Descending).

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 2

--- Student List ---

ID: 77, Name: Deepak, CGPA: 9.6

ID: 12, Name: Sachin, CGPA: 8.8

ID: 14, Name: Vipul, CGPA: 8.6

=== Student Database Menu ===

1. Add Student

2. Display Students

3. Sort by Name (Bubble Sort)

4. Sort by CGPA Ascending (Selection Sort)

5. Sort by CGPA Descending (Selection Sort)

6. Exit

Enter your choice: 5