National University of Computer and Emerging Sciences



Lab Manual 06

Object Oriented Programming

Date : 13th April, 2021

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| Section | BDS-2A |
| Semester | Spring 2021 |

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## Objectives

After performing this lab, students shall be able to:

1. Strings
2. Reference of objects
3. Default copy constructor
4. Array of objects.

# Task 1:

In this task you have to create a class student, create separate .h file and .cpp file to implement the class.

The student should have following private data.

1. String Name, default value “”
2. integer Roll No, default value 0
3. Mid 1 marks (float), default values 0
4. Mid 2 marks (float), default values 0
5. Final Exam marks (float), default values 0
6. Quiz marks, there will be 4 quizzes. You can save this as dynamic array of 4 floats. Intial value of quizzes should be 0. Total quizzes are 4 so you don’t need to keep length of array.

Use string library, and don’t forget to include it;

Student will have following public functions

// will set default values using member initializer list. Allocate space to quizzes set default values to 0

Student();

// will set default values using member initializer list, and set the given name and roll number

// Allocate space to quizzes, set default values to 0

Student(name, rollNo);

void print();

void setname(string);

void setRollNo(int);

void setMid1Marks(float marks);

void setMid2Marks(float marks);

void setFinalMarks(float marks);

// will set the marks of the given quiz number

// for example if setQuizMarks(10, 2) is called then changes should be made in quiz[1]

void setQuizMarks(float marks, int quiz\_number);

// returns the sum of all quizzes mids and final

float getTotalScore();

//returns 0 if both students have equal total marks

// returns 1 if calling object student has higher total marks

// return 2 if call object student has lower total marks

int compare(Student &S);

//copies all the data of S in calling student. Should create deep copy

void copy(Student &S);

~Student()// should print “Destructor invoked for <student name>” and deallocated dynamic data

# Task 2

Create a driver.cpp file with main function.

In this file create main function

Create S1 and S2 as shown in code

Which object is created using default copy constructor?

## Task 2A:

Change the data of objects to see which values of S1 are deep copies in S2 and which ones are shallow? Fill the table

|  |  |
| --- | --- |
| Code | output |
| Student S1("Ali", 1);  S1.print();  Student S2= S1;  S2.print(); | Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0  Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0 |

|  |  |  |
| --- | --- | --- |
| Which values of S2 are Deep copy of S1? | Deep copy | Shallow copy |
| Name |  |  |
| Rollno |  |  |
| Mid1 marks |  |  |
| Mid 2 marks |  |  |
| Final marks |  |  |
| Quiz marks |  |  |

## Task 2B:

Now run the following code in main, change the values of S1 and S2 and see which values of S2 are deep copy and which ones are shallow

|  |  |
| --- | --- |
| Code | output |
| Student S1("Ali", 1);  S1.print();  Student S2;  S2= S1;  S2.print(); | Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0  Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0 |

|  |  |  |
| --- | --- | --- |
| Which values of S2 are Deep copy of S1? | Deep copy | Shallow copy |
| Name |  |  |
| Rollno |  |  |
| Mid1 marks |  |  |
| Mid 2 marks |  |  |
| Final marks |  |  |
| Quiz marks |  |  |

## Task 2C:

Now run the following code in main, change the values of S1 and S2 and see which values of S2 are deep copy and which ones are shallow

|  |  |
| --- | --- |
| Code | output |
| Student S1("Ali", 1);  S1.print();  Student S2;  S2.copy(S1);  S2.print(); | Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0  Name: Ali  Roll\_no 1  Mid1 0  Mid2 0  Final 0  quiz 1: 0  quiz 2: 0  quiz 3: 0  quiz 4: 0 |

|  |  |  |
| --- | --- | --- |
| Which values of S2 are Deep copy of S1? | Deep copy | Shallow copy |
| Name |  |  |
| Rollno |  |  |
| Mid1 marks |  |  |
| Mid 2 marks |  |  |
| Final marks |  |  |
| Quiz marks |  |  |

# Task 3:

1. Create an array of 3 students named students\_array in driver.cpp. The data of students is given below. Populate the values as given in table using setter functions.

Array can be 1D dynamic or non-dynamic.

|  |  |  |  |
| --- | --- | --- | --- |
| Data | Student 0 | Student 1 | Student 2 |
| Name | Ali | Sara | Ahmed |
| Rollno | 1 | 2 | 3 |
| Mid1 marks | 12 | 13 | 14 |
| Mid 2 marks | 15 | 14 | 13 |
| Final marks | 50 | 44 | 67 |
| Quiz marks | 0,0,0,0 | 5,4,0,0 | 0,0,0,9 |

1. Now create a function in driver.cpp file that takes array of students and its size and print all the students.

Function header is

void printStudentArray(Student \*arr, int size)

Call it in main for students\_array

1. Now Create function named highestScorer in drive.cpp file that take array of students and print the student will highest total score. This function should use the member function compare

Call this function for students\_array.

Its output in this case will be

Name: Ahmed

Roll\_no 3

Mid1 14

Mid2 13

Final 67

quiz 1: 0

quiz 2: 0

quiz 3: 0

quiz 4: 0

Note that your functions should work for any 1D array and not just for the one used in this example.