Department of Data Science and Computer Applications (DSCA) | MIT Manipal

End Term OOP Lab Examination (Batch 1)
17/01/2022 [Code: MCA 4162]
Duration: 2 hrs. coding + 1 hr. evaluation] Time: 2-5 pm [Marks: 40

Important: Format of Question Paper

PART A: Problem Statement

PART B: Instructions for Write-up Submission

PART C: Instructions for Source Code Submission

PART A

Problem Statement: Faculty Workload

You have leveraged your experience of 7 to 8 weeks training @DSCA MIT Labs working on C++ Programming to become the **head programmer** for the MIT In-house Solutions Lab ***(MISL)***. Congratulations!!

Your first assignment will be working on a **Workload Calculation** task. Generating a Timetable is an important activity for any department or institute because it requires multiple factors to be considered such as availability of staff, availability of room, number of staff available in a department and others. Timetable mostly involves workload calculations.

As a part of your assignment you must design an application ***to calculate the workload (in units)*** based on the faculty allotted subjects in the timetable for the Department of Data Science and Computer Applications given the following scenarios:

1. Two programs are offered: BTech and MCA
2. Three semesters are running together: I Semester MCA, III Semester MCA and III Semester BTech DSE (Data Science and Engineering)
3. Each **theory** subject is either **a 4-credit or a 3-credit subject** which means total number of contact hours is either 4 hours or 3 hours per week. However, the workload is calculated as **2 units per contact hour.**
   Example: 3 contact hours per week implies workload of 6 units (3 x 2 = 6) and so on.
4. Each **practical session of 3 hours** is calculated as **one unit**. So, if a faculty is assigned two labs in a week, workload would be 3 x 2 = 6.
   Here you can assume all faculty gets one lab in one semester (any subject), while calculating the final workload.
5. The workload breakup depending on designation is as follows:
   a. Professor: 6-12 units per week
   b. Associate Professor: 22-24 units per week
   c. Assistant Professor: 26-28 units per week
6. All faculty must be assigned a subject mandatorily.

Your Assignment: Implement the above case study using two classes ***Faculty and WorkLoad. Use appropriate data types for the members of the class.***

1. Faculty class is **abstract base class** with attributes and function prototypes:

First Name of Faculty (Characters)
Last Name of Faculty (Characters)
Employee ID of Faculty (Unique numeric code)
Abbreviation of Faculty (Only two characters unique combination)
Designation of each faculty (Numeric: 1 for Professor, 2 for Associate Professor and 3 for Assistant Professor)

The operations are:

Virtual void display_data()=0;
Virtual void input();

Sample Data is given below:

Emp	Faculty Names	Faculty Abbrv.	Designation
1291	John Doe	JD	Professor
1308	Liam Nelson	LN	Professor
1607	Andrea Logan	AL	Associate Professor
1800	Clark Kent	CK	Assistant Professor
1809	Robin Long	RL	Assistant Professor
1856	Natasha Brown	NB	Assistant Professor
2020	Margaret Smith	MS	Assistant Professor
2121	Charles Xavier	CX	Assistant Professor

2. WorkLoad class will have the following data:
Program code (Numeric: 970 or 907)
Program Name (Automatically set as 970 for MCA and 907 for DSE)
Semester ID (Numeric: 1for I Sem MCA, 2 for III Sem MCA or 3 for III Sem DSE)
*Subject code (*Numeric)
Subject Name (Characters)
Credits (Numeric 3 or 4 only)
Total workload (Numeric)
Max workload (Numeric)

The operations to be performed are:

Void input();
Void Create_faculty Abbreviation(); // this will convert Andrea Logan to AL
Void find_max_workload(); //based on designation, max workload to be calculated
void Calculate_workload(); //Total workload for each faculty
void display_data(); //as per format shown in next page

Sample output:

Program Code	Program Name	Semester ID	Subject Code	Subject Name	Credits	Emp ID
970	MCA	1	4154	Software Engineering	3	1607
970	MCA	2	5151	Computer Networks	4	1607
907	DSE	3	2151	Data Analytics	3	1607

Faculty Emp ID: 1607
Faculty Name: Andrea Logan
Designation: Associate Professor
Total workload = [Theory] + *[Practical]*
= [(3 x 2) + (4 x 2) + (3 x 2)] + *[3 x 1]*
= 6 + 8 + 6 + 3 = 23

Task 1: Develop the C++ working application for 2 classes.....…… (25 marks)
Task 2: Output in given format .....(5 marks)
Task 3: Validations wherever applicable ……. (5 marks)

- ✓ Program name as per program code entered (2 marks)
- ✓ Designation wise workload calculation (3 marks)

Task 4: Process the workload for n faculty members using array of base class pointers (5 marks)

Total: 40 marks

Notes: You may write additional helper functions to solve the problem

PART B: Write-Up (2.00 – 2.40 pm)
No late submissions on chat or email allowed.
PART C: Source code (3.45 – 4 pm)
No late submissions allowed

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