Department of Computer Science
The City College of CUNY

CSc 22100: Software Design Laboratory [Summer 2022]

Assignment 4

A PDF or MS Word <u>report</u> showing:

[1] *The full code of the Java application developed,*
[2] *The database ER diagram, schema, keys, foreign keys, and constraints,*
[3] *The DDL and SQL statements used (separately from the Java code), and*
[4] *The outputs produced for the tasks indicated,*

is due by 11:59 *pm on* <u>Tuesday, 26 July 2022</u>. *The deadline is strictly observed.*

Online demonstration of your application will take place during regular class time on Thursday, 28 July 2022. Further details, including the Zoom link for the online demonstration, will be provided in a Blackboard announcement.

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1. Consider the **Student** database schema below.

    Students(<u>empID</u>, firstName, lastName, email, gender)
    Courses(<u>courseID</u>, courseTitle, department)
    Classes(<u>courseID</u>, <u>studentID</u>, <u>sectionNo</u>, year, semester, grade)

    The underlined attributes are the primary keys of their corresponding tables. The value of attribute gender may only be *F*, *M*, or *U*, referring, respectively, for *female*, *male*, or *unidentified*. The only letter grades allowed in the database are *A*, *B*, *C*, *D*, *F*, or *W*.

    Further you are provided the class schedule for the Spring 2022 semester in file *scheduleSpring2021.txt*. The key to the data in *scheduleSpring2021* is (<u>courseID</u>, <u>sectionNo</u>).

2. Using a Relational Database Management System (RDBMS) of your choice, your tasks are to:

    A. Create and populate a **Schedule** table using the data provided in file *scheduleSpring2021.txt*.

    B. Create and populate **Courses** and **Classes** tables using the data in table **Schedule**.

    C. Create and populate **Students** and **Classes** tables using data of your own together with the data in table **Schedule**.

D. Using GROUP BY, Calculate and output the number of students for each letter grade in CSc 33600 [Introdcution to Database Systems] in the Spring 2021 semester.

E. Build and test a Java application that [1] connects to the database, [2] creates, [3] populates, and [4] updates the **Students**, **Courses**, **Classes**, and **AggregateGrades** tables. The application should utilize *PreparedStatement* objects for the execution of DDL statements and SQL queries.

F. The Java application utilizes a class **Database** which includes inner classes **Schedule**, **Students**, **Courses**, **Classes**, and **AggregateGrades**, corresponding, respectively, to database Tables **Schedule**, **Students**, **Classes**, and **AggregateGrades**. The constructor of class **Database** may be utilized to establish a connection to the RDBMS, while the constructors of the inner classes may be used to create and populate the corresponding database Tables.

G. Class **Database** implements interface **ClassScheduleInterface** which includes fields and static methods that define the DDL and SQL expressions used for creating, populating, and querying the database tables.

H. Utilize the classes in Assignment 3, including **HistogramAlphaBet** and **MyPieChart**, to build and display a pie chart showing the proportion of students for each letter grade. In the pie chart:

a. Each segment has a different color;
b. Each segment has a legend showing the corresponding grades and number of students;
c. The segments for the grades are displayed in alphabetical order.

3. The report should show [1] sample input tables, [2] output table for the stated query and corresponding pie chart for a sufficient amount of input data, and [3] example[s] of the use of the update function.

4. You may only use JavaFX graphics and your own classes and methods for the operations included. Further,

a. The code is applicable to canvases of variable height and width;
b. The size of the pie chart is proportional to the smallest dimension of the canvas;
c. The segments of the pie chart are filled with different colors of your choice, specified through a **MyColor** *enum* reference type.

5. Explicitly specify all the classes imported and used in your Java application.

Best wishes!
Hesham A Auda
17 July 2022