Concordia University
Dept. of Computer Science and Software Engineering
COMP 353 – Databases
Winter 2023
Assignment 1

**Submission through Moodle is due by Monday, January 30th at 23:55**

Maximum Points: 80.
**Note: This is the same assignment 1 as before but with details of the questions 2 to 4 reproduced from the textbook, for conveninence.**

1. [20 Points] This question is to help better understand the costs and efforts involved in development and maintenance of applications using database systems compared to file processing systems. Your solution to this question will be evaluated/marked mainly based on your observations and comments on comparison of advantages and disadvantages of the two approaches.

   Consider an application that deals with the following tables; the underlined attributes in each table form the key of that table.

   Students = {SID, Name, Program, Address}
   Courses = {CID, Name, Credits}
   Courses-Enrolled = {SID, CID, Grade}

   Also consider the query Q: "Find the name and ID of every student who took Databases and obtained at least B+."

   (a) Write a program in your favorite *imperative language* (e.g., Java, Python, C) that develops the program to create these tables with records and computes and report the output of the query Q: You may NOT use or connect to any DBMS to perform any aspects of the programming involved.

   (b) Use a DBMS to create the above tables, formulate the same query Q in SQL, and report the query output.

2. [20 Points] Exercise 2.3.1, parts: c, d, e, f on page 36 in the textbook. Consider the following database schema for a Computer Equipment store (CED):

   ```
   Product(maker, model, type)
   PC(model, speed, ram, hd, price)
   Laptop(model, speed, ram, hd, screen, price)
   Printer(model, color, type, price)
   ```

   The attributes of relation *Product* include: manufacturer, Model, and the equipment Type; the attributes of relation *PC* include Model, Speed, RAM, HD, and Price; For relation *Laptop*, the attributes include the following attributes: Model, Speed, RAM, HD, Screen, Price; and for relation *Printer*, we have the attributes Model, Color, Type,

Price. Some explanations about this database. Relation *Product* records information about the model number and type of each equipment which could be *pc, laptop*, or *printer*. For convenience, assume that the model numbers of the equipments are unique across all manufacturers and product types. This assumption is not realistic, so *explain how you would modify the database schema for a realistic situation?*

For each model number of a PC, the *PC* relation records the processor speed (in GHz), the RAM size (in MB), the size of the hard disk (in GB), and the price (in dollar). The information stored as the *Laptop* relation is similar to *PC* except that it records the screen size (in inches) as well. The color attribute in *printer* could have the true/false value, which indicates whether it is a color printer or otherwise. A printer type could be *laser* or *ink-jet*. Write the following schema declarations or modifications in SQL.

(c) A suitable schema for relation *Laptop*.

(d) A suitable schema for relation *Printer*.

(e) A modification to your *Printer* schema from (d) to delete the attribute `color`.

(f) A modification to your *Laptop* schema from (c) to add the attribute `od` (for optical-disk type, e.g., cd or dvd). Use "none" as the default value if the laptop does not have an optical disk.

3. [20 Points] Exercise 6.2.1, parts: a, b, c, d on page 267 in the textbook, which asks to express a few SQL queries over the MOVIE database schema defined as follows:

```
Movies(title, year, length, genre, studioName, producerC#)
StartsIn(movieTitle, movieYear, starName)
MovieStar(name, address, gender, birthdate)
MovieExec(name, address, cert#, netWorth)
Studio(name, address, presC#)
```

(a) Who were the male stars in `Titanic`?

(b) Which stars appeared in movies produced by MGM in 1995?

(c) Who is the president of the studio MGM?

(d) Which movies are longer than `Gone With the Wind`?

4. [20 Points] Exercise 6.5.1, parts: a, c, e, f on page 295 in the textbook, with details as follow. Consider the schema of the CED database introduced above in question 2. Using SQL, express the following modifications on the data.

(a) Using two `INSERT` statements, store in the database the fact that the *PC* model 1100 is made by manufaturer C, has speed 3.2, RAM 1024, hard disk 180, and sells for $2499.

(c) Delete all PC's with less than 100 GB of hard disk.

(e) Manufacturer A buys manufacturer B. Change all products made by B so they are now made by A.

(f) For each PC, double the amount of RAM and add 60 GB to the amount of hard disk. Note that several attributes can be changed by a single `UPDATE` statement.