CSE278: Introduction to Systems Programming (Systems I)

Homework #6
Due: Friday April 10, 2019 before 11:59 PM
Email-based help Cutoff: 5:00 PM on Wed, April 8, 2020
Maximum Points: 50

Submission Instructions

This part of the homework assignment must be turned-in electronically via Canvas. Ensure you name this document *HW6_MUID*.docx, where *MUid* is your Miami University unique ID. (Example: HW6_ahmede.docx)

Copy pasting from online resources is **Plagiarism**. Instead you should read, understand, and use your own words to respond to questions.

Submission Instructions:
Once you have completed answering the questions save this document as a PDF file (**don't just rename the document; that is not the correct way to save as PDF**) and upload it to Canvas.

General Note: Upload each file associated with homework (or lab exercises) individually to Canvas. Do not upload archive file formats such as zip/tar/gz/7zip/rar etc.

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Objective

The objective of this homework is to review basic concepts of:
- RDBMS and MySQL from lecture slides
- Relational databases
- SQL queries

Required reading
Prior to answering the questions in this homework briefly review the following chapters from the E-book titled "MySQL, Fifth Edition". Link available on Canvas→Syllabus page.
- Chapter 1: Getting started
- Chapter 2.1 to 2.7: Using SQL to manage data

- Lecture Slides SQL-Part1
- Lecture Slides SQL-Part2
- Lab#6 (Solution)

1. What is a relational database (2-3 sentences)? [2 points]

    A relational database is a database structure that focuses on organizing data into tables with rows and column. Each row in the table is a data record that can contain several pieces of information and each column corresponds to each piece of the record. Relational databases are very good at pulling data from tables and joining them with common elements.

2. What is a DBMS and its expansion? What is the difference between a database and a DBMS? [3 points]

    DBMS (which stands for Database Management System) is a management system that allows for inserting, deleting and moving rows of data in a database. The difference between a database and a DBMS is that a database is the repository that stores the information, and the DSMS provides the overhead to edit that database, allowing you to modify the databases contents.

3. What is schema of a database? [1 points]

    The schema of a database is the layout that the database will have for a particular implementation. It contains information about column and attribute names, data types and any primary keys used in the database.

4. What must be true in order for an attribute to be a key? How do you denote a key in a schema? [2 points]

    In order for an attribute to be a key it's value must be unique in the column they are created in. A key is denoted by it being underlined.

5. What is the difference between CHAR(n) and VARCHAR(n) data types? [2 points]

    The difference between the CHAR(n) and VARCHAR(n) data types is that CHAR(n) is a fixed string with a length of the inputted size n, which means it can't be smaller or larger than that value; whereas VARCHAR(n) is a string that

can be of any length smaller than or equal to the inputted size, allowing for it to be more variable in size.

6. What property ensures consistency of a database? [2 points]

The relational database management system (RDBMS) ensures consistency by using the ACID (Atomicity, Consistency, Isolation, Durability) principles when managing operations on tables.

7. Illustrate the 2 SQL CREATE statements to create the following 2 related tables (based on column `ssn`). You may assume suitable data types for the different columns: [4 points]
   - `Person(ssn, name, age, email)`
   - `Relationship(ssn1, ssn2, info)`

```
CREATE TABLE Person (
    ssn VARCHAR(64) NOT NULL,
    name VARCHAR(64) NOT NULL,
    age INT NOT NULL,
    email VARCHAR(64),
    PRIMARY KEY (ssn)
);
```

8. Illustrate the SQL commands to insert 3 people (you can make up the data/information) into the following table: `Person(ssn, name, age, email)` [3 points]

INSERT INTO Person (ssn, name, age, email) VALUES ('555-555-5555', 'Steve Robs ', 45, 'steverobs@gmail.com'), ('666-666-6666', 'Bob Riger', 67,

'brg@gmail.com'),   ('777-777-7777',   'Indiana   Jones',   45, 'indijones@gmail.com')

9. Illustrate SQL command to delete all persons who are older than 125 years, from the following table: `Person(ssn, name, age, email)` [2 points]

   DELETE FROM Person where age > 125;

10. What is projection? Illustrate with an example SQL statement. [2 points]

    Projection is the part of the SQL statement that deals with choosing which columns the query shall run. For example, given then SQL statement, "SELECT pname FROM Product," the projection part is "pname," because that is the column the query shall interact and return from.

11. Given the schema below (assume suitable data types), complete the following C++ program to print all the attributes for a given product name (`pname`) specified as the only command-line argument to the program   [**2 points**]

    ```
    Product(pname, price, category, manufacturer)
    ```

    ```cpp
    // Assume all necessary headers have been included

    int main (int argc, char *argv[]) {
        // Connect to database with: database, server, userID, password
        mysqlpp::Connection myDB("prodDB", "ec2.aws.com", "amazon",
                "password");
        // Create a query
        mysqlpp::Query query = myDB.query();




        // Write rest of the program here
        query << "SELECT pname, price, category, manufacturer FROM Product;";
    ```

```
   query.parse();

   mysqlpp::StoreQueryResult result = query.store();

   for(size_t row = 0; (row < results.size()); row++) {
      std::string pname = result[row][0].c_str();
      float price = result[row][q]
      std::string category = result[row][2].c_str();
      std::string manufacturer = result[row][3].c_str();
      std::cout << "Name:" << pname << "\tprice:" << price << "\tCategory: "
<< category << "\tManufacturer: " << manufacturer << "\n";
   }
   // All done
   return 0;
}
```

Submission

- No late assignments will be accepted!
- This work is to be done individually
- The submission file will be saved with the name *HW6_yourMUID.pdf*
- Assignment is due before Midnight Friday April 10, 2020.
- On or before the due time, drop the *electronic copy* of your work in the *canvas*
- Don't forget to Turn in the file!   HW6_yourMUID.pdf