

Please read Sections 1 – 1.3.4 and Chapter 3 of the textbook and then answer the following, trying not to look at your notes or at the textbook. Quiz #1, on Wednesday 24th January, will consist of questions taken or inspired from Part I & II of this homework.

Part I — Short Questions

Question 1

Is a pile of trash a database? Why, or why not?

Question 2

Which one comes first, the physical design, the conceptual design, or the logical design?

Question 3

What is the difference between a database and the meta-data of the database?

Question 4

In a DBMS environment, do I have to change my program if I want to change the structure of my data?

Question 5

What is a virtual data? How can I access it?

Question 6

Why do DBMS include concurrency control?

Question 7

Row •	• Attribute
Connect the dots: Column header •	• Tuple
Table •	• Relation

Question 8

What do we call the number of attributes in a relation?

Question 9

At the logical level, does the order of the tuples in a relation matter?

Question 10

What should we put in an attribute if its value is unknown?

Question 11

What, if any, is the difference between a superkey, a key, and a primary key?

Question 12

Are we violating an integrity constraint if we try to set the value of a primary key to NULL? If yes, which one?

Question 13

Give three examples of operations.

Question 14

Define what is the domain constraint.

Question 15

Consider the following three relations:

AUTHOR(AuthorRef, AuthorName, Address)

BOOK(ISSN, AuthorRef, Title)

GAINED_AWARD(AwardReference, ISSN, AWARD_TITLE)

For each relation, answer the following:

- (a) What is the primary key?
- (b) Are there, presumably, any foreign key?

Question 16

Consider the following three relations

TRAIN(TrainRef, Model, Year)

CONDUCTOR(CompanyID, Name, ExperienceLevel)

ASSIGNED_TO(TrainRef, CompanyID, Date)

- (a) What are the foreign keys in the ASSIGNED_TO relation?
- (b) Assuming the database is empty, are the following instructions valid? If not, what integrity constraint are they violating?

Insert <'AM-356', 'Surfliner', 2012> into TRAIN

Insert <NULL, 'Graham Palmer', 'Senior'> into CONDUCTOR

Insert <'XB-124', 'GPalmer', '02/04/2018'> into ASSIGNED_TO

Insert <'BTed', 'Bobby Ted', 'Senior'> and <'BTed', 'Bobby Ted Jr.', 'Junior'> into CONDUCTOR



Part II — Problems

This part will help you in assessing your level of understanding of this lecture, and give you an idea of the kind of problems you will be asked to solve during the exams. Problem 2 requires a computer, an Internet connection, and some time. It is critical that you successfully complete this part for the rest of this class. I'll assume that you completed those two problems by the time Homework #2 is released (Wednesday 24th January), so don't wait and let me know if you had any trouble doing them.

Problem 1

We want to define a CAMPUS database organized into three files as follows:

- A BUILDING file storing the name and GPS coordinates of each building.
 - A ROOM file storing the building, number and floor of each room.
 - A PROF file storing the name, phone number, email and room number where the office is located for each professor.
- (a) Complete the following database catalog corresponding to the CAMPUS database (having a look at Figure 1.3, in your textbook, can be of some help):

RELATIONS

Relation_name	No_of_columns
BUILDING	2
.....
PROF

COLUMNS

Column_name	Data_type	Belongs_to_relation
Building_Name	Character(30)	Building
GPS	Double (1)
Building_Name	Character(30)	ROOM
Room_Number	Integer(1)	ROOM
Floor
Prof_Name
.....
.....
Room_Number	PROF

- (b) Invent a database with 2 buildings, 3 rooms and 2 professors.
- (c) Answer the following, assuming all the knowledge you have of the situation comes from the CAMPUS database, which is an up-to-date and accurate representation of its miniworld:

- i. Is it possible to list all the professors?
- ii. Is it possible to tell in which department is a professor?
- iii. Is it possible to get the office hours of a professor?
- iv. Is it possible to list all the professors whose offices are in the same building?
- v. Is it possible to list all the rooms?
- vi. If a new professor arrives, and has to share his office with another professor, do you have to revise your database catalog?
- vii. Can you list which professors are at the same floor?
- viii. Can you tell which professor has the highest evaluations?

Problem 2

In this problem, you will install the MySQL DataBase Management System and set it up. On top of being open source and free, it is one of the most widespread and used DBMS, as well as one of the most well-documented. Linux users will use its community-developed fork, MariaDB, but that won't make a difference in this course.

It is very important that you follow the steps below carefully. Read the messages printed on your screen, make sure a step was correctly executed before moving to the next one. And, remember: 1) Don't wait, set your system early. 2) I'm willing to help you, but there's nothing I can do with an email like "It doesn't work": if you look for help, be detailed and clear about what you think went wrong. The following links could be useful:

- <https://dev.mysql.com/doc/refman/5.7/en/windows-installation.html>,
- <https://dev.mysql.com/doc/refman/5.7/en/linux-installation-native.html>,
- <https://dev.mysql.com/doc/refman/5.7/en/connecting-disconnecting.html> and
- <https://www.linode.com/docs/databases/mysql/how-to-install-mysql-on-debian-8>

1. The first step is to install MySQL. Below are the instructions for Windows 10 and for Linux. It is perfectly acceptable to install MySQL on a virtual machine for this class (remember that on <http://spots.augusta.edu/tschultz/resources/SWAvailable.html>, you can have access to VMware and Windows licences, but using Virtual Box or Linux should also work fine). Once this step is completed, or if MySQL is already installed on your computer, go to the next step.

For Windows 10 (a) Visit <https://dev.mysql.com/downloads/installer/>, click on "Download" next to "Windows (x86, 32-bit), MSI Installer 5.7.20 18.5M (mysql-installer-web-community-5.7.20.0.msi)". On the next page, click on the (somewhat hidden) "No thanks, just start my download." button.

- (b) Save the "mysql-installer-web-community-5.7.20.0.msi" file, and open it. If there is an updated version of the installer available, agree to download it. Accept the license term.
- (c) We will now install the various components needed for this class, leaving all the choices by defaults. This means that you need to do the following:
 - i. Leave the first option on "Developer Default" and click on "Next"
 - ii. Click on "Next" even if you don't meet all the requirements
 - iii. Click on "Execute". The system will download and install several softwares (this may take some time).
 - iv. Click on "Next" twice, leave "Type and Networking" on "Standalone MySQL Server / Classic MySQL Replication" and click "Next", and leave the next options as they are (unless you know what you do and want to change the port, for instance) and click on "Next".
 - v. You now need to choose a password for the MySQL root account. It can be anything, just make sure to memorize it. Click on "Next".
 - vi. On the "Windows Service" page, leave everything as it is and click on "Next".

- vii. On the “Plugins and Extensions” page, leave everything as it is and click on “Next”.
- viii. Finally, click “Execute” on the “Apply Configuration” page, and then on “Finish”.
- ix. Click on “Cancel” on the “Product Configuration” page and confirm that you don’t want to add products: we only need to have MySQL Server 5.7.20 configured.
- (d) We now want to make sure that MySQL is running: launch Windows’ “Control Panel”, then click on “Administrative Tools”, and on “Services”. Look for “MySQL57”, its status should be “Running”. If it is not, right-click on it and click on “Start”.

For Linux (a) Install, through your standard package management system (apt or aptitude for debian-based systems, pacman for Arch Linux, etc.), the packages `mysql-client` and `mysql-server` as well as their dependencies.

- (b) Open a terminal and type

```
/etc/init.d/mysql status
```

to see if MySQL is running: if you read

```
Active: active (running)
```

then you can move on to the next step, otherwise run (as root)

```
service mysqld start
```

- (c) As root, type in your terminal

```
mysql_secure_installation
```

You’ll be asked to provide the current password for the root MySQL user: this password has not been defined yet, so just hit “Enter”. You’ll be asked if you want to set a new password (that you can freely choose, just make sure to memorize it). Then, answer “n” to the question “Remove anonymous users?”, “Y” to “Disallow root login remotely?”, “n” to “Remove test database and access to it?” and finally “Y” to “Reload privilege tables now?”.

2. We will now log-in as root.

In Windows Open a command prompt (search for “cmd”) and type

```
cd "C:\Program Files\MySQL\MySQL Server 5.7\bin"
```

and then

```
mysql -u root -p
```

Enter the password you picked at step 1(c)v. You are now logged as root in your database management system, you should see a brief message, followed by a prompt

```
mysql >
```

In Linux As root, type in your terminal

```
mysql -u root -p
```

Enter the password you picked at step 1c. You are now logged as root in your database management system: you should see a brief message, followed by a prompt

```
MariaDB [(none)]>
```

3. This step will create a non-root user and grant it some rights. Type the following three commands, one by one (that is, type the first one, hit “enter”, type the second, hit “enter”, etc. The colors are here to ease the reading, you can ignore them safely.):

```
CREATE USER 'testuser'@'localhost' IDENTIFIED BY 'password';
GRANT ALL PRIVILEGES ON `HW\_%` . * TO 'testuser'@'localhost';
EXIT;
```

The message prompted after the two first commands should be

```
Query OK, 0 rows affected (0.00 sec)
```

and the message after the last command should be

Bye

Be careful: back-tics are surrounding HW_, whereas single quotes are surrounding “testuser” and “localhost” (normally, copy-and-pasting from this document should work).

4. We now log as the normal user called “testuser”. Linux users should type *as a normal user, i.e., not as root*, in their terminal the following, and Windows users should type in their command prompt the following (provided working directory is still C:\Program Files\MySQL\MySQL Server 5.7\bin):

```
mysql -u testuser -p
```

Enter password as your password. If at some point you want to know if you are logged as root or testuser, simply enter

```
\s;
```

5. Now, type the following commands one by one:

```
CREATE DATABASE HW_1Q2;
USE HW_1Q2;
CREATE TABLE t(i integer, n integer);
INSERT INTO t VALUES (1,1),(2,2),(3,3);
SELECT * FROM t;
```

After that last command, you should see

```
+-----+-----+
| i     | n     |
+-----+-----+
| 1     | 1     |
| 2     | 2     |
| 3     | 3     |
+-----+-----+
```

You’re all set! All you have to do is to quit, using the command

```
EXIT;
```