COMP2350/6350 Database Systems

Practical – Week 8

Objectives:

- To understand how database objects such as tables, constraints and indices can be created and "destroyed" directly using SQL.
- To learn different ways of creating constraints.
- To learn how to modify the structure of existing database objects
- To appreciate the significance of the order in which different database objects are created.
- The tasks are developed in the context of Tutorial tasks for Week 7. The relevant part of that document is appended at the end of this Practical specification.

Task Specifications:

Task 0: Creating the Schema/Database for this Practical

*** Students should create a brand new schema. Assuming that students can have only a single schema named by their userID (say MQ12345678), they may need to drop and create a new one. We assume that this schema/database has been selected. The following may be used***

```
DROP SCHEMA mq12345678;   %% error if this schema does not exist
CREATE SCHEMA mq12345678; %% error if this schema already exists
```

So safer to use:

```
DROP SCHEMA IF EXISTS mq12345678;
CREATE SCHEMA IF NOT EXISTS mq12345678;

USE mq12345678;
```

Task 1: Verify that there are no tables in this database

You can check it graphically or:

```
mysql> show tables;
```

There should be no user table here. If there is, go back and recreate the schema

Task 2: Creating a table (with a primary key)

1. *Create the Hotel table*

```
create table Hotel (
        hotelNo int,
        name varchar(30),
        address varchar(50)
        );
```

2. *Verify that the table is created*

```
mysql> describe Hotel;
```

3. *Ouch! You forgot to specify the primary key. Fix it!*

- One way:

```
Drop table Hotel;
create table Hotel (
        hotelNo int PRIMARY KEY,
        hotelname varchar(30),
        address varchar(0)
        );
```

- Another way:

```
Drop table Hotel;
create table Hotel (
        hotelNo int,
        hotelname varchar(30),
        address varchar(50),
        PRIMARY KEY (hotelNo)
        );
```

- Still another way (using alter table statement):

```
Drop table Hotel;
create table Hotel (
        hotelNo int,
        hotelname varchar(30),
        address varchar(50)
        );

ALTER TABLE Hotel
ADD CONSTRAINT PK_No PRIMARY KEY (hotelNo);
```

4. *You want the primary key of this table to be automatically incremented as new rows are inserted.*

```
Drop table Hotel;
create table Hotel (
        hotelNo int AUTO_INCREMENT,
        hotelname varchar(30),
        address varchar(50),
        PRIMARY KEY (hotelNo)
        );
```

5. *What is the structure of this table?*

```
describe Hotel;
```

Task 3: Creating a table with a foreign key

1. *Create the table Room (roomNo, hotelNo, type, price)*

```
Drop table IF EXISTS Room;
create table Room (
        roomNo int,
        hotelNo int,
        type varchar(10),
        price int,
        PRIMARY KEY (roomNo, hotelNo)
        );
```

2. *But you forgot to specify the intended foreign key. Fix it!*

```
        ALTER TABLE Room
        ADD CONSTRAINT FK_No FOREIGN KEY (hotelNo)
                        REFERENCES Hotel(hotelNo);
```

3. *You want the room type to be not null*

```
ALTER TABLE Room
MODIFY type varchar(10) NOT NULL;
```

4. *You also want that the room type must be either "Comfort" or "Executive" or "Luxury"*

```
ALTER TABLE Room
ADD CONSTRAINT chk_type CHECK (type in ('Comfort',
                                'Executive','Luxury')
                        );
```

5. *Verify the structure of the Room table*

```
describe Hotel;
```

6. *Could you have done all this in one go?*

   - Here is one way – try other ways. Play around – say impose another constraint that the price must not be less than 100 Dollars

```
Drop table IF EXISTS Room;

create table Room (
          roomNo int,
          hotelNo int,
          type varchar(10) NOT NULL CHECK (type in
                ('Comfort', 'Executive', 'Luxury')),
          price int,
PRIMARY KEY (roomNo, hotelNo),
CONSTRAINT FK_No FOREIGN KEY (hotelNo)
                    REFERENCES Hotel(hotelNo)
                    );
```

Task 4: Create other tables for Week 7 Tut, populate them and query them

Create the other tables (with appropriate PKs and FKs):

```
Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)
Guest (guestNo, guestname, address)
```

Populate them with some made-up data, and then try some of the queries from the tutorial. Keep in mind the kind of queries you want to try and insert appropriate data. Alternatively, based on data, modify the queries appropriately. This is left for students to do on their own.

Task 5: Explore what other things can you do with DDL

This is left for students to do on their own. A good point to start is to look at the links under "MYSQL DATA DEFINITION" at https://www.mysqltutorial.org. A supplement has also been provided for your quick reference. It helps to be somewhat adventurous and play around. Try out:

1. Creating and dropping views, indices, different constraints and other database objects
2. Adding new columns to a table; dropping existing columns from it
3. Renaming tables and their columns
4. Truncating a table (keep a table, but remove all the data from it)
5. Try to "read" the DDL code generated by WorkBench. Eg. what does the following mean?

   ```
   ENGINE = InnoDB
   ```

6. Find out about *cascading constraints*. For instance, what would the following (alternative) FK constraint on the Room table would have additionally achieved?

   ```
   CONSTRAINT FK_No FOREIGN KEY (hotelNo)
   REFERENCES Hotel(hotenNo)
   ON DELETE CASCADE
   ```

Appendix: from Week7 Tutorial

The following tables form part of a database held in a relational DBMS Hotel schema.

```
Hotel (hotelNo, name, address)
Room (roomNo, hotelNo, type, price)
Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo
Guest (guestNo, name, address)
```

The conventions used in representing the schemas above are standard.

Construct SQL statements to answer the following queries.

a) List full details of all hotels.

b) List full details of all hotels in London.

c) List the names and addresses of all guests in London, alphabetically ordered by name.

d) List all double or family rooms with a price below £40.00 per night, in ascending order of price.

e) List the bookings for which no `dateTo` has been specified.

f) How many hotels are there?

g) What is the average price of a room?

h) What is the total revenue per night from all double rooms?

i) List the price and type of all rooms at the Grosvenor Hotel.

j) List all guests currently staying at the Grosvenor Hotel.

k) What is the total income from bookings for the Grosvenor Hotel today?

l) List the number of rooms in each hotel.

m) List the number of rooms in each hotel with more than 100 rooms and located in London.