EXERCISE LIST N°4:
Advanced SQL Queries

I. Air-conditioner relational model

The relational model that we are going to use for this part corresponds to the database of an enterprise fixing air-conditioners. It corresponds to the database of an enterprise fixing air-conditioners. Technicians are sent for an intervention in a customer's house and fix the air-conditioner. They may have to replace air-conditioner parts or the whole air-conditioner (both parts air-conditioners are stored in the table PRODUCTS). After one or more interventions of technicians, the air-conditioner is fixed, the customer pays for the reparations and an invoice is issued. **Depending on his/her skills, each technician has his own hourly rate (salary per hour).** The relational model is the following:

CUSTOMER (**cust_no**, name, surname, address, city, ZIP, tel)
PRODUCT (**reference**, designation, unit_price, stock_quantity, min_quantity)
INVOICE (**inv_no**, date, state, *customer#*)
REPLACEMENT (***product#, intervention#,*** qtity)
INTERVENTION (**interv_no**, date, *technician#*, duration, *invoice#*)
TECHNICIAN (**tech_no**, name, hour_rate)

Translate these queries into SQL.
You can reply to these questions using Word on any DBMS. You'll find on Teams the ddl (Data Definition Language) file to create the database, but it has been written in PostGreSQL. So, there might be some modifications if you want to run it using SQL Server. You can choose to use Word or a DBMS, this will **not have any influence on your grade**. In any case, please submit just 1 pdf file in the assignment section.

1. What are the identifiers of the customers (attribute cust_no), for whom **NO** invoice has been issued. Give **three answers**: the first one using EXCEPT, the second one using NOT IN and the third one using NOT EXISTS.

2. Which are the references, designations and unit prices of all the products, except the cheapest? Give four answers: the first one using the keyword ANY, the second one using the keywords EXCEPT and ALL, the third one using the keyword NOT IN and ALL, and the last one using NOT EXISTS and ALL.

3. Which are the invoices identifiers for which both the technicians « Bonnaz » and « Mauras » have worked (give three answer: the first one using INTERSECT, the second one using IN and the third one using EXISTS)?

4. Give the list of ALL the references of all the products (no matter if they were replaced or not), along with the intervention numbers and the replaced quantity, when these products were actually replaced (if they were never replaced, then you should just obtain NULL).

5. Give the total number of technicians.

6. Give the average unit price of a product. This new attribute will be called "Average"

7. List of all the invoices identifiers (sorted by ascending order) and the number of related interventions. Please rename the latter attribute as "number_interv".

8. References of the products which have been replaced at least twice (*i.e.* two times), together with the number of times they have been replaced.

9. For each intervention, give its identifier and the total amount for all the replaced parts in that intervention (take into account the unit price AND the quantity of the products replaced, for each intervention).

10. Who is the customer (cust_no and name) who had the highest number of interventions (provide a solution with a nested query)? Please also give the number of interventions for that customer.

11. Total amount of the salary, for each invoice identifier. This amount is the salary of the technician (depending on his hourly rate and of the duration of the intervention), for each intervention corresponding to that invoice.

12. Total price of each invoice. This price includes the price of the replaced places, and the salary of the technician (depending on his hourly rate and of the time spent), for each intervention depending on that invoice.

II. Hotels relational model

The relational model which we're going to use in this part corresponds to a database for managing bookings in multiple hotels. In this part, we're going to focus on **divisions.** Please just use Word and/or paper for this exercise, and provide ONE PDF file assignment.

HOTELS (hotel_no, hotel_name, zip, city)
ROOMS (hotel, room_no, type, price)
BOOKINGS (hotel, customer, arrival_date, departure_date, room)
CUSTOMERS (cust_no,cust_name,country)

1. Add the primary keys (underlined attributes) and foreign keys (add a # after the attribute name) on the relational model above.

2. Draw a scheme of this relational database. In that scheme, every table will be represented by a rectangle and every referential integrity constraint will be represented by a link between two tables. You can add multiplicities as you would define them in an UML class diagram. No table should be completely isolated from the others.

3. Which are the hotels from Niort that hosted all the customers from Spain?

4. Customers who booked in all the hotels of Niort.

5. Hotels that hosted all the customers from Switzerland.