National College of Ireland

Higher Diploma in Science in Computing

HDSDEV_JAN_HDAIML_JANOL, CIC_FEBOL, HDSDEV_SEPOL_YR1, HDCYB_JANOL_HDWD_JANOL, HDCSDEV_INTJAN22

Semester I, May
Release Date: May 15th 2022 9:00am
Submission Deadline: May 21st 2022 23:55

Introduction to Databases

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This TABA will cover the following learning outcomes

LO1 Analyse and evaluate current and future trends in database technologies
LO2 Construct and evaluate data models based on analysis of data requirements
LO3 Comprehend and describe the relational database model
LO4 Design, implement and evaluate a relational database system with an appropriate database package
LO5 Formulate and assess advanced SQL queries and commands

Exam Instructions

Please read carefully all instructions before starting the exam

Submission: Two links are available on Moodle for the submission of TABA. Link 1 is mandatory to upload TABA report.

Link 1 (Mandatory): Upload **Single file** (MS Word/ pdf) report submission including SQL code, illustrations, images, snaps or handwritten work (Turnitin link). Please, use the format below for the filename.

[LastName]_[FirstName]_[Program]_IDB_TABA

Link 2: Upload zip folder that may contain any supporting material (SQL code files or any images or snaps, for the justification of your answers in the submitted report at link 1)

[LastName]_[FirstName]_[Program]_IDB_TABA_SUP.zip

Turnitin database will be used to check the plagiarism of submitted report at link 1.
Citrix Tools available: MySQL Workbench, Microsoft Visio and MS Office are available to complete this TABA. Include reference to any material you have used to answer the questions.

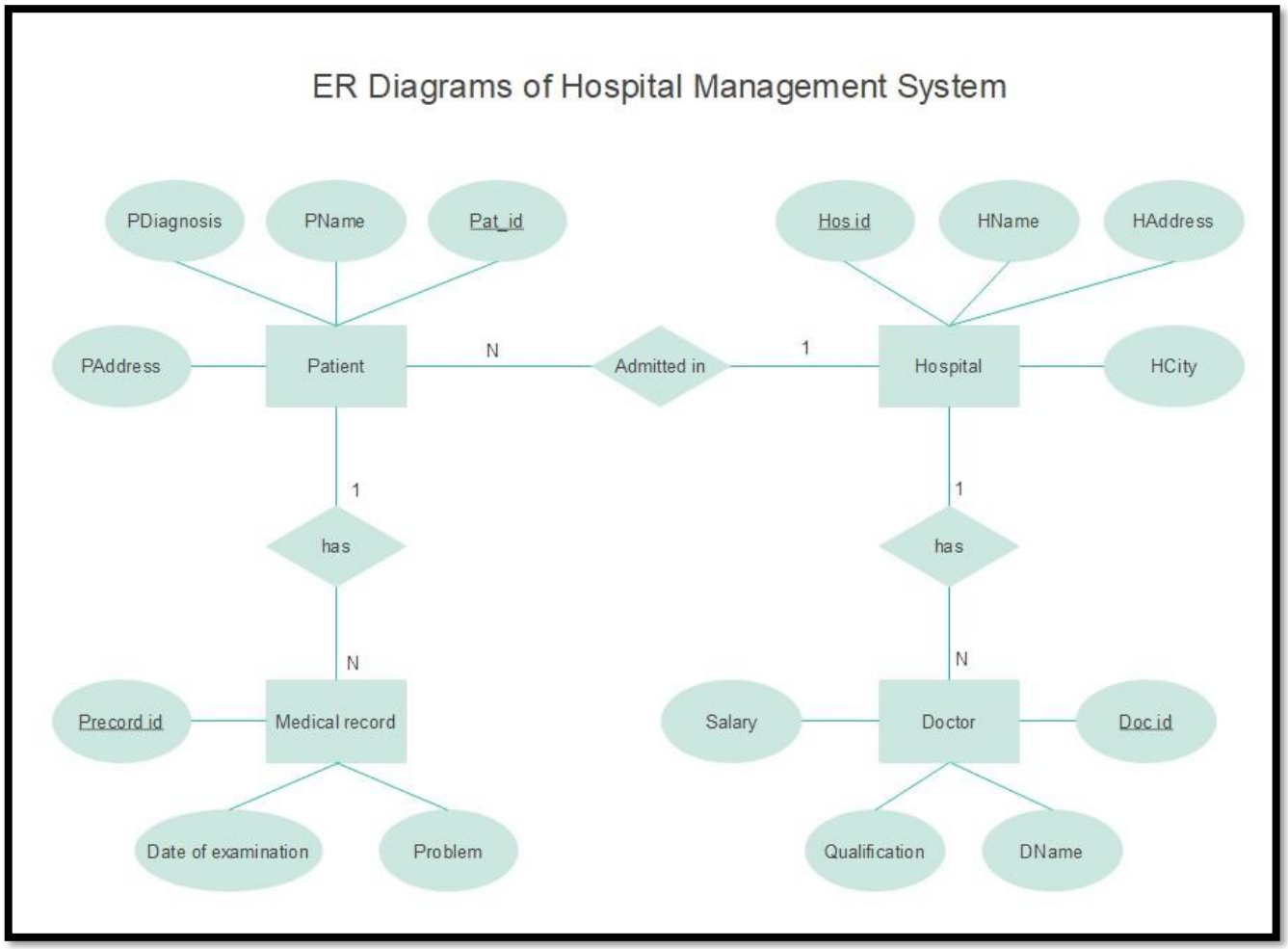
Note: ***This is an individual personal assignment, co-operation or collaboration among students is strictly not allowed and may result in disqualification. Students may be asked to outline/explain in person the reason for any approach taken or solution provided.***

Attempt all questions and each question worth 20 marks in total. Choose the appropriate option for Q3 and Q4.

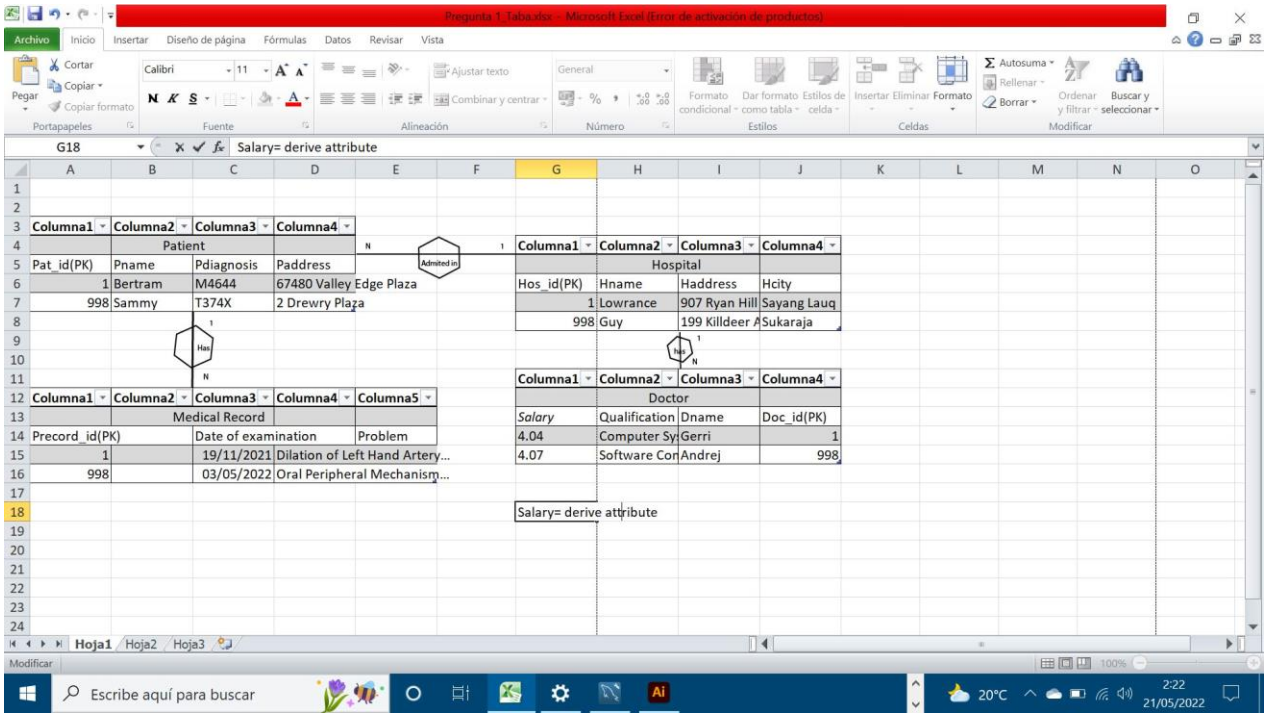
Carefully examine the following description and Entity Relationship Diagram and answer Question 1, and 2

A hospital management system wants to ensure that information regarding health care is managed properly. The database designers of the hospital came up with the following ER diagram with four entities and three relationship types (read left to right).

- A large number of healthcare providers/doctors work in a hospital.
- There is an influx of patients in every hospital. It is difficult to maintain such a large database. Thus, ER diagrams help in analyzing such a large database with ease.
- Since every patient has a medical record, it is very costly to store these records in hard copy. So, it is better for the records to be stored in soft copy.



1. **Transform the conceptual design (ER diagram) into a physical design by converting the entities and relationships into their appropriate tables. Show if your tables are normalized using 1st, 2nd, and 3rd normal form. [20 Marks]**



For this diagram, I didn't find foreign key, only primary key, as you can see. Because I can't find a unique key in the schema apart from the primary key that is the key that identify an object in the unique form.

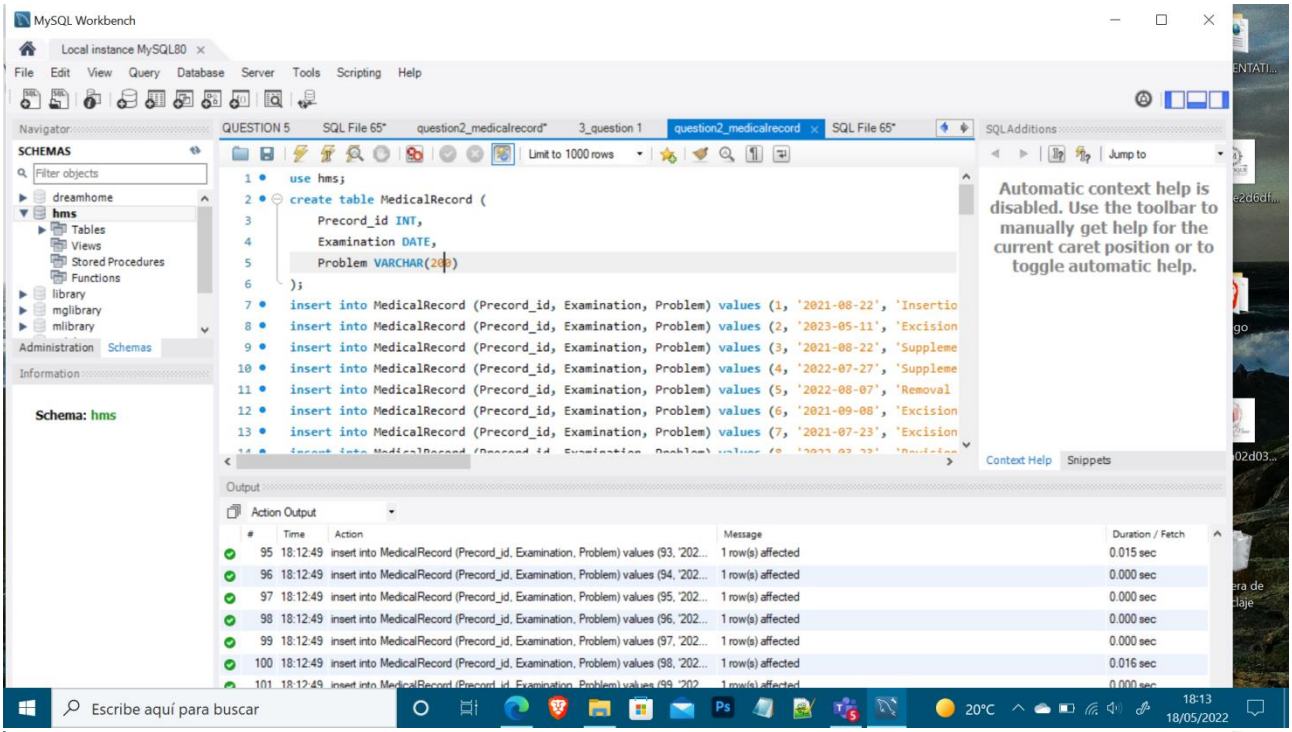
I decided to put the salary as a derivate attribute that it could depend on the qualification or experience of the doctor to change the value, like an age for example.

Finally, I put my table in the 2nd form due to this be in 1st model and the attributes not depends on the primary key.

Corregido con https://www.corrector.co/es/

2. Create a database called HMS and convert all the resulting logical tables from question 1 into aphysical database design using DDL. Choose the appropriate datatype, primary and foreign

keys for the attributes. Fill your table with some data of your choice (you can use Mockaroo to createthe data). Provide detailed assumptions for any of your design decisions. [20 Marks]


MySQL Workbench
Local instance MySQL80
File Edit View Query Database Server Tools Scripting Help
Navigator
SCHEMAS
Filter objects
dreamhome
hms
Tables
Views
Stored Procedures
Functions
library
mglibrary
mlibrary
Administration Schemas
Information
Schema: hms
QUESTION 5
SQL File 65*
question2_medicalrecord*
3_question 1
question2_medicalrecord
SQL File 65*
Limit to 1000 rows
use hms;
create table MedicalRecord (
Precord_id INT,
Examination DATE,
Problem VARCHAR(200)
);
insert into MedicalRecord (Precord_id, Examination, Problem) values (1, '2021-08-22', 'Insertio
insert into MedicalRecord (Precord_id, Examination, Problem) values (2, '2023-05-11', 'Excision
insert into MedicalRecord (Precord_id, Examination, Problem) values (3, '2021-08-22', 'Suppleme
insert into MedicalRecord (Precord_id, Examination, Problem) values (4, '2022-07-27', 'Suppleme
insert into MedicalRecord (Precord_id, Examination, Problem) values (5, '2022-08-07', 'Removal
insert into MedicalRecord (Precord_id, Examination, Problem) values (6, '2021-09-08', 'Excision
insert into MedicalRecord (Precord_id, Examination, Problem) values (7, '2021-07-23', 'Excision
SQLAdditions
Jump to
Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.
Context Help Snippets
Output
Action Output
Time Action Message Duration / Fetch
95 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (93, '202... 1 row(s) affected 0.015 sec
96 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (94, '202... 1 row(s) affected 0.000 sec
97 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (95, '202... 1 row(s) affected 0.000 sec
98 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (96, '202... 1 row(s) affected 0.000 sec
99 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (97, '202... 1 row(s) affected 0.000 sec
100 18:12:49 insert into MedicalRecord (Precord_id, Examination, Problem) values (98, '202... 1 row(s) affected 0.016 sec
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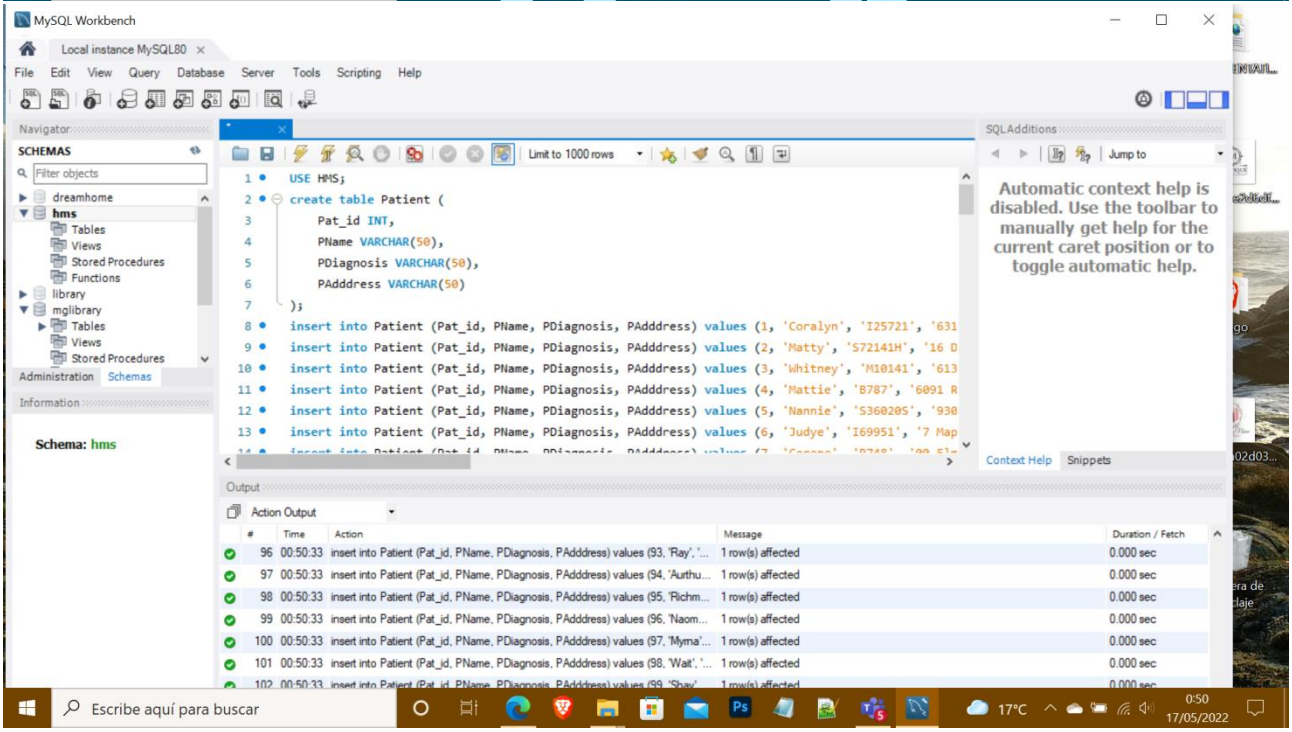
18/05/2022


MySQL Workbench
Local instance MySQL80
File Edit View Query Database Server Tools Scripting Help
Navigator
SCHEMAS
Filter objects
dreamhome
hms
Tables
Views
Stored Procedures
Functions
library
mglibrary
Tables
Views
Stored Procedures
Administration Schemas
Information
Schema: hms
Limit to 1000 rows
USE HMS;
create table Patient (
Pat_id INT,
PName VARCHAR(50),
PDiagnosis VARCHAR(50),
PAdddress VARCHAR(50)
);
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (1, 'Coralyn', 'I25721', '631
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (2, 'Matty', 'S72141H', '16 D
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (3, 'Whitney', 'M10141', '613
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (4, 'Mattie', 'B787', '6091 R
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (5, 'Nannie', 'S36020S', '930
insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (6, 'Judye', 'I69951', '7 Map
SQLAdditions
Jump to
Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.
Context Help Snippets
Output
Action Output
Time Action Message Duration / Fetch
96 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (93, 'Ray', '... 1 row(s) affected 0.000 sec
97 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (94, 'Aurthu... 1 row(s) affected 0.000 sec
98 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (95, 'Richm... 1 row(s) affected 0.000 sec
99 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (96, 'Naom... 1 row(s) affected 0.000 sec
100 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (97, 'Myrna'... 1 row(s) affected 0.000 sec
101 00:50:33 insert into Patient (Pat_id, PName, PDiagnosis, PAdddress) values (98, 'Wait', '... 1 row(s) affected 0.000 sec
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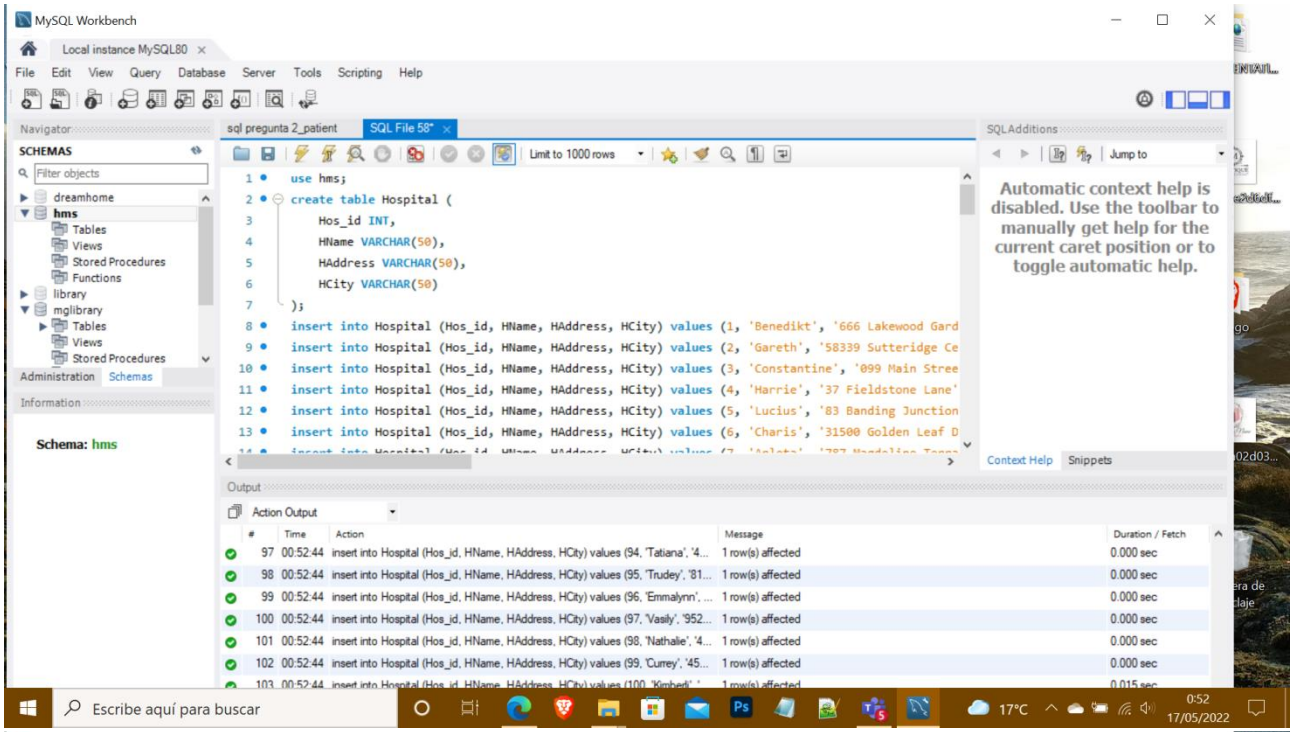
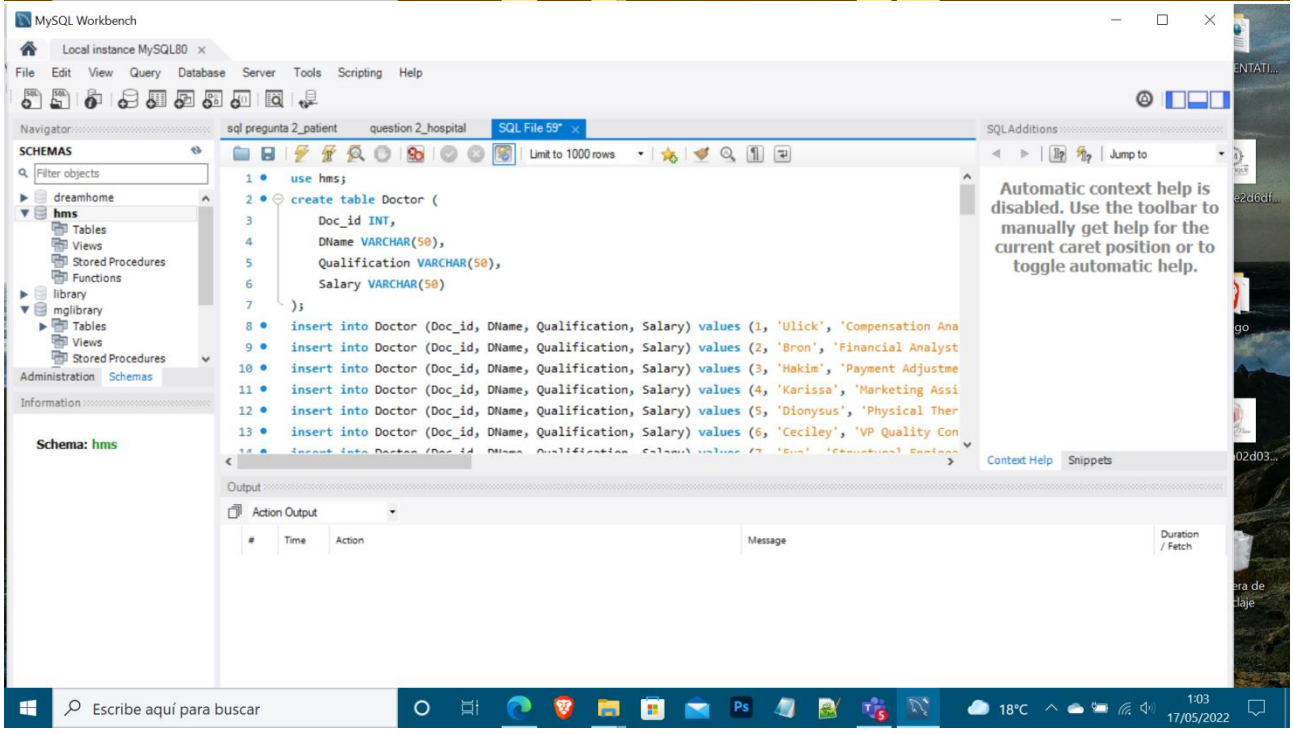
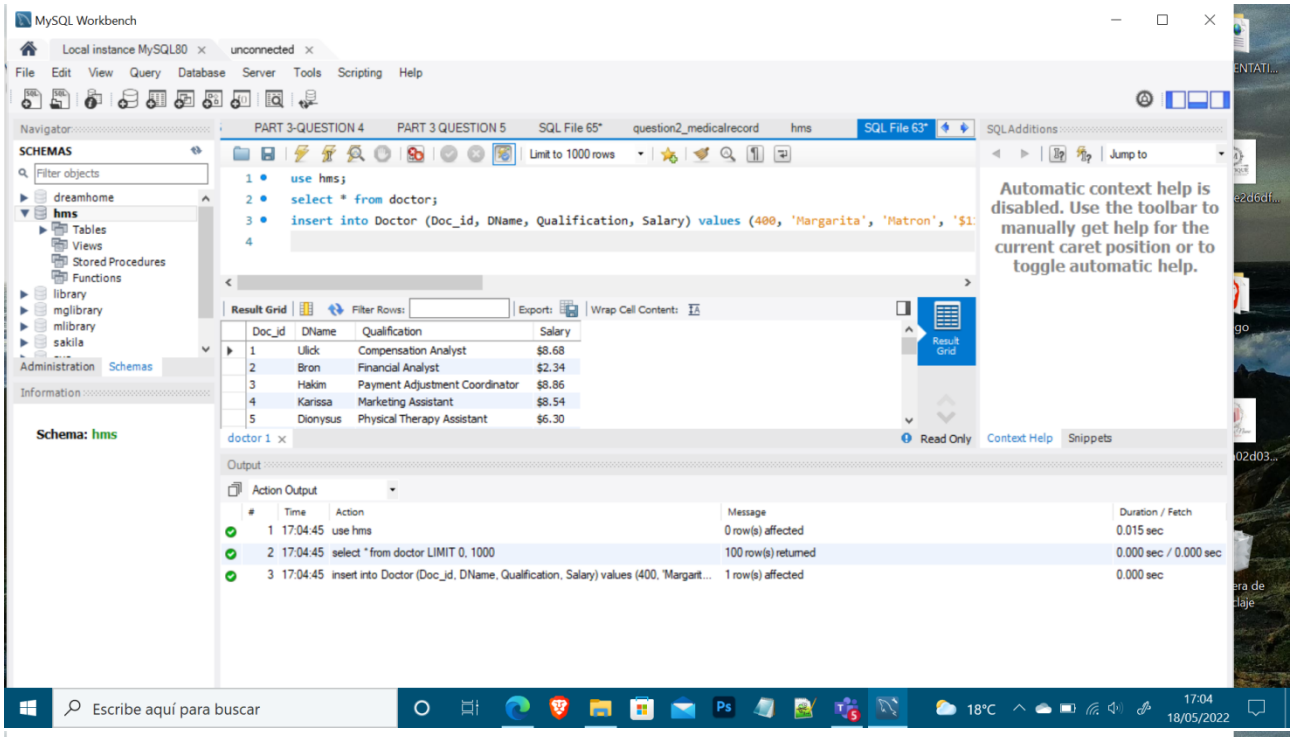
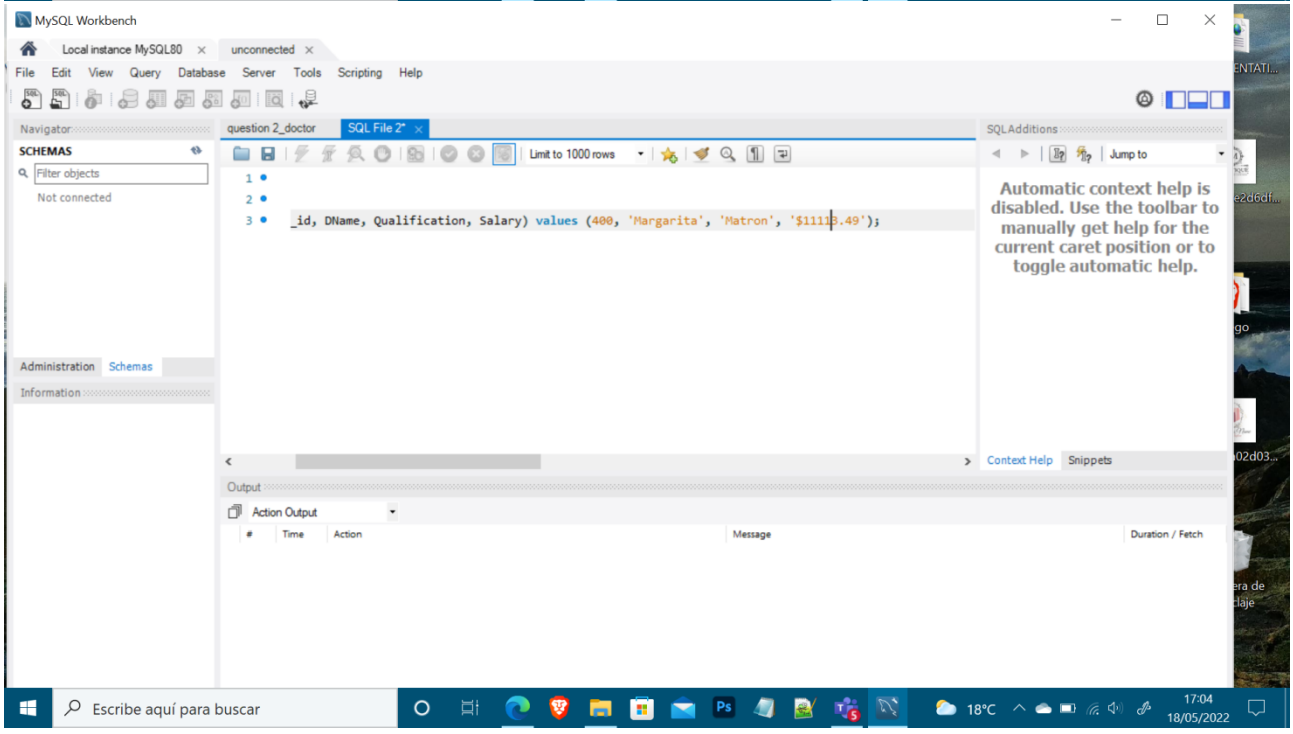




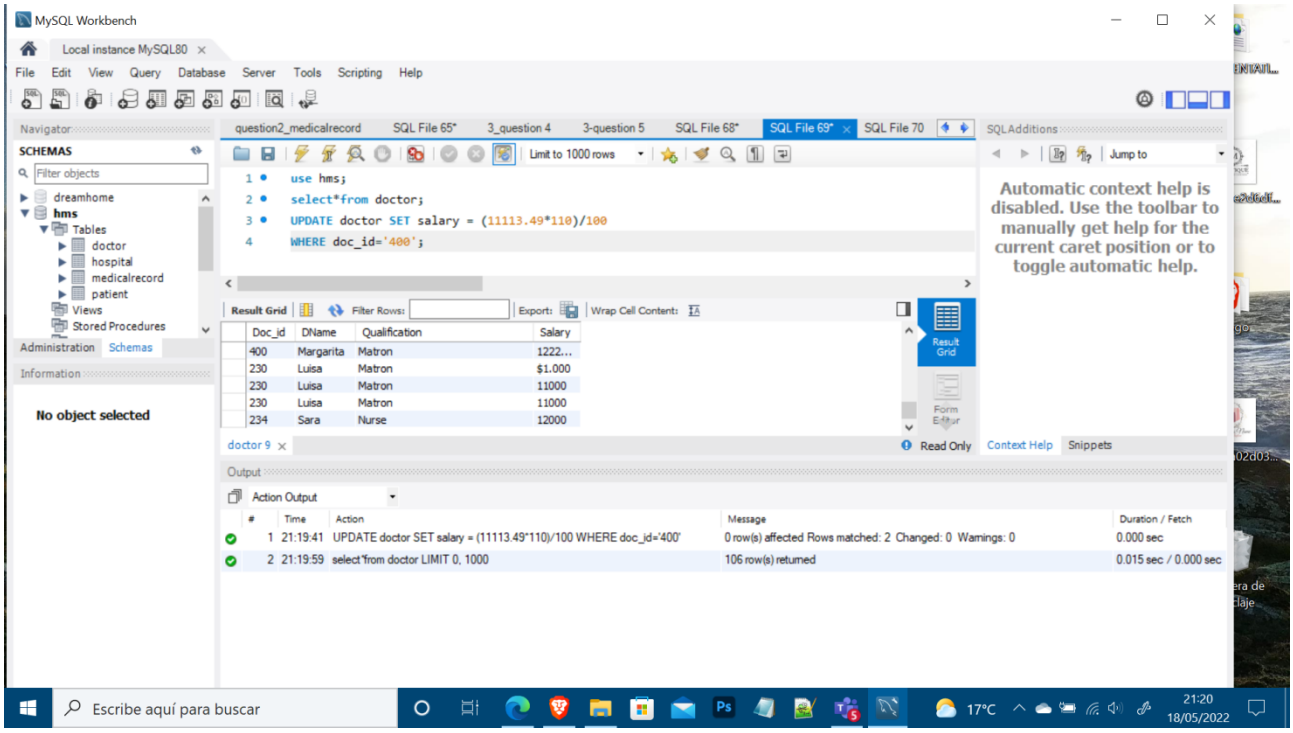
3. Using your database created in question 2 answer the following question using SQL statements:

i. Insert a new Doctor with all the relevant information (2 marks)

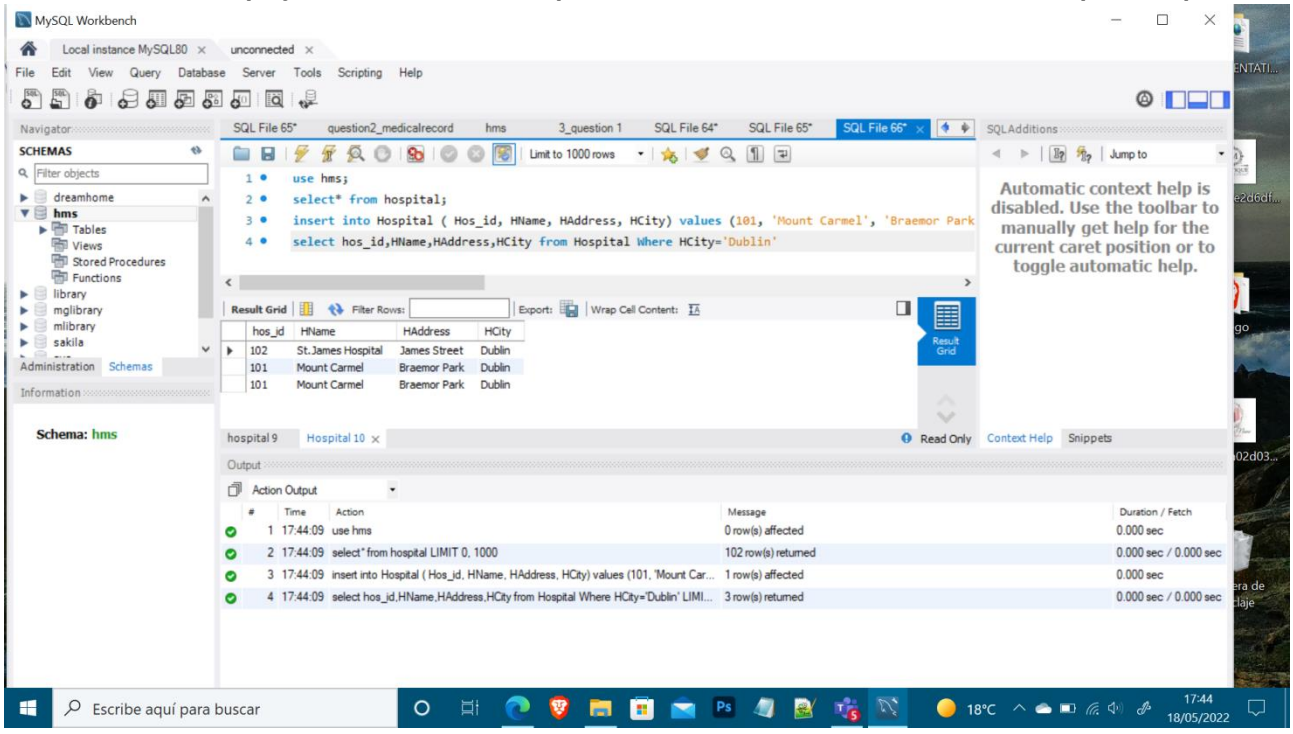




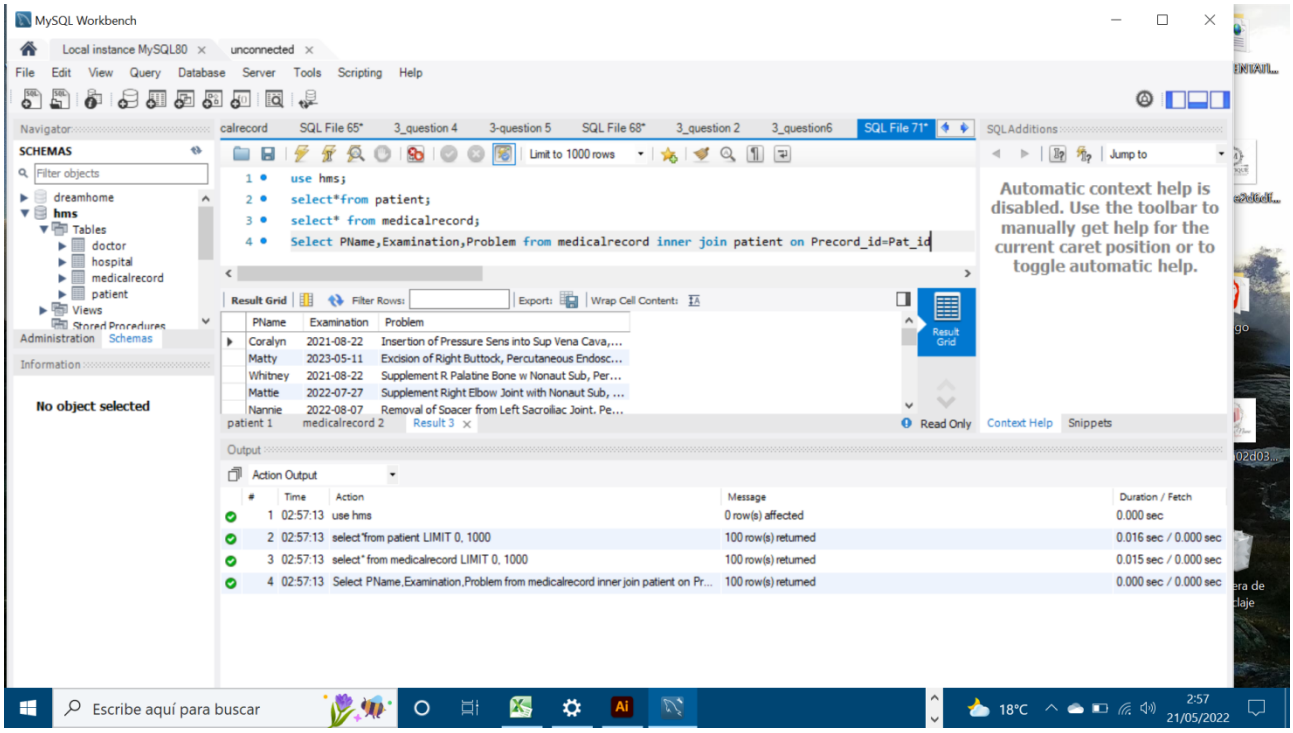
ii. Increases the salary of Doctor by 10% (2 marks)



iii. Display the details of all hospitals based in Dublin (3 marks)



iv. List the name patients, problems that they have and the date of examination. (4 marks)


MySQL Workbench
Local instance MySQL80
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File Edit View Query Database Server Tools Scripting Help
Navigator
SCHEMAS
Filter objects
dreamhome
hms
Tables
doctor
hospital
medicalrecord
patient
Views
Stored Procedures
Administration Schemas
Information
No object selected
calrecord SQL File 65* 3_question 4 3-question 5 SQL File 68* 3_question 2 3_question6 SQL File 71*
Limit to 1000 rows
1 use hms;
2 select*from patient;
3 select* from medicalrecord;
4 Select PName,Examination,Problem from medicalrecord inner join patient on Precord_id=Pat_id
SQLAdditions
Jump to
Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.
Result Grid Filter Rows: Export: Wrap Cell Content:
PName Examination Problem
Coralyn 2021-08-22 Insertion of Pressure Sens into Sup Vena Cava,...
Matty 2023-05-11 Excision of Right Buttock, Percutaneous Endosc...
Whitney 2021-08-22 Supplement R Palatine Bone w Nonaut Sub, Per...
Mattie 2022-07-27 Supplement Right Elbow Joint with Nonaut Sub, ...
Nannie 2022-08-07 Removal of Spacer from Left Sacroiliac Joint, Pe...
patient 1 medicalrecord 2 Result 3
Result Grid
Read Only
Context Help Snippets
Output
Action Output
Time Action Message Duration / Fetch
1 02:57:13 use hms 0 row(s) affected 0.000 sec
2 02:57:13 select*from patient LIMIT 0, 1000 100 row(s) returned 0.016 sec / 0.000 sec
3 02:57:13 select* from medicalrecord LIMIT 0, 1000 100 row(s) returned 0.015 sec / 0.000 sec
4 02:57:13 Select PName,Examination,Problem from medicalrecord inner join patient on Pr... 100 row(s) returned 0.000 sec / 0.000 sec
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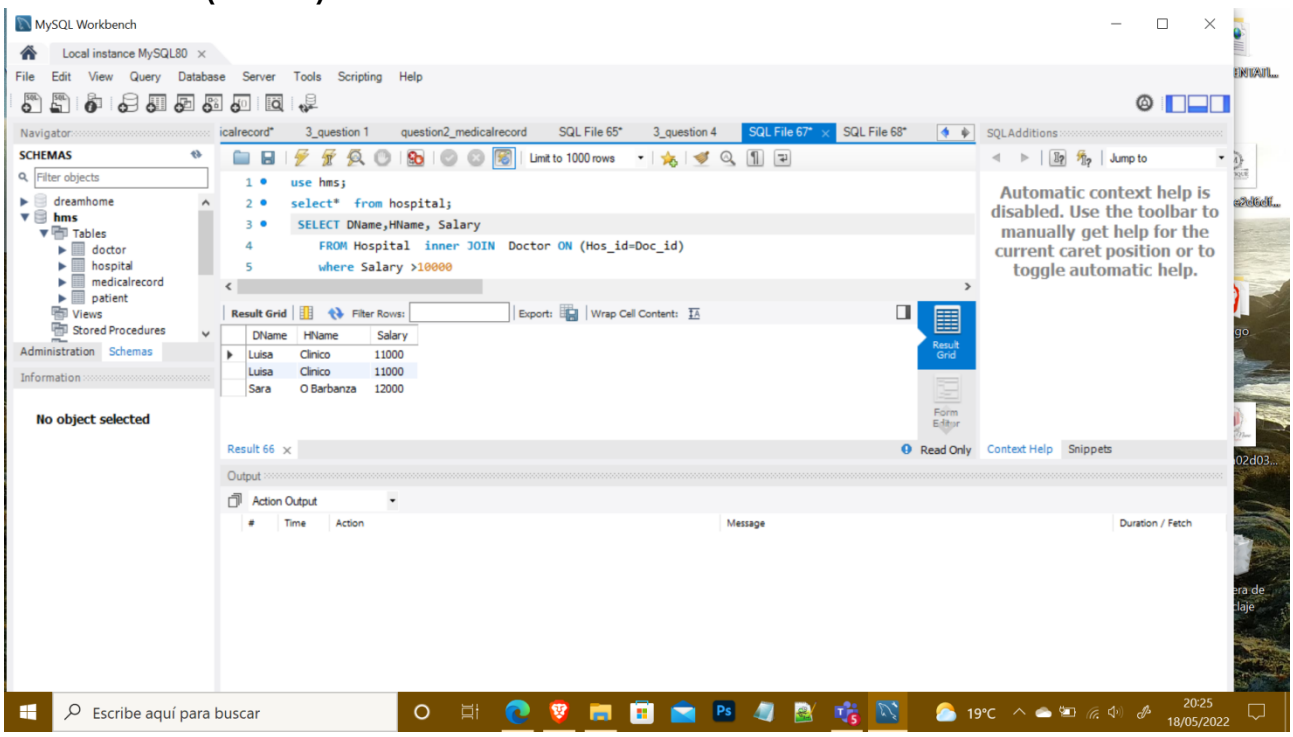
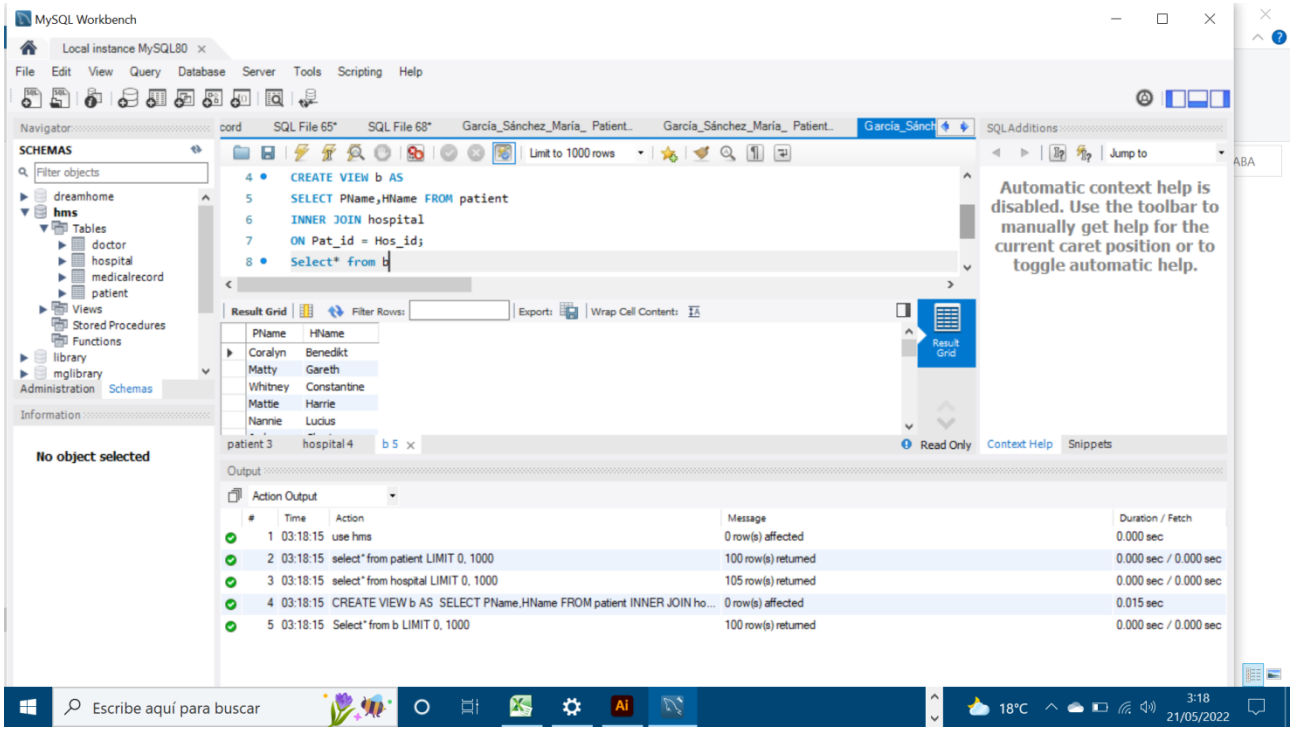
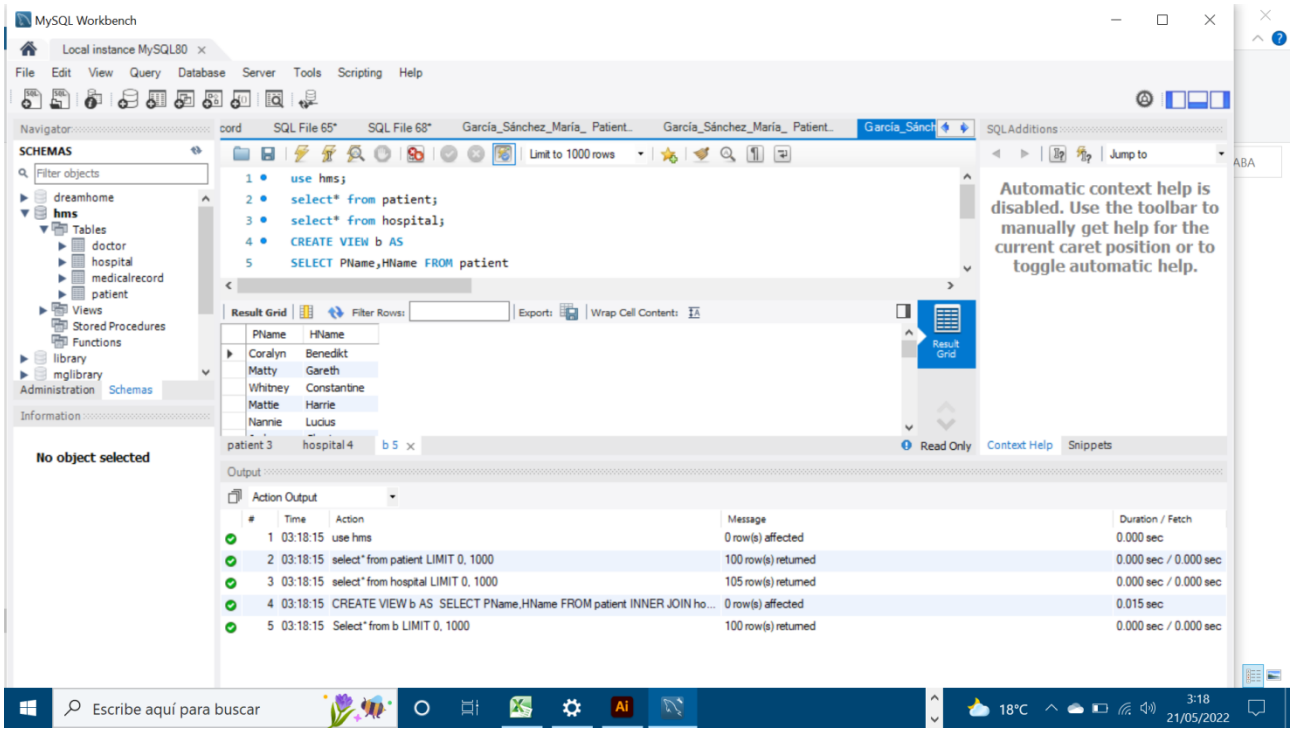
21/05/2022

List the name of doctors and the name of hospital they are working at if they have a salarybigger than 100000 (4 marks)



v. **Create a view that shows the name of patients and the hospital that they reside in. (5 marks)**





4. Discuss the BASE characteristics of non-relational databases by choosing one of the contexts below. Discuss the four types of non-relational databases along with the scenarios suitable to use and avoid them. [20 Marks, Maximum 600 Words]

- **i. Context 1: Social media**
- **ii. Context 2: Big data from IoT devices**
- **iii. Context 3: Data-driven and Semantic Web.**
- **iv. Context 4: Airbnb record management system**

If your NCI ID ends with

0,1 or 2 use context
1
3,4 or 5 use context 2
6,7 use context 3
8,9 use context 4

In the beginning to understand better the explanation of this question, I think that is helpful to defining in a short way the concepts: Data-driven and Semantic Web. First, Data-Driven means the methodology that a business for chose decision and creates a strategic plan, such as the big companies: Google, Twitter,Accenture… Secondly, Semantic Web is an extension of a normal Web, and it tries to make a filter automatically, but it needs information, for example made that users search information that they want in a quick manner.

This kind of stuff work with different systems and one of them is the no relational databases, is store system which the principal characteristic is that it not use the SQL language for the consults. The no relational model use the wide-column, graphics, memory and key value and the most famous system is NoSQL.I am going to put different examples that are applicable to the both concepts that I studied. For example the no relational databases use a key-value for referring an age or name for example for my understanding when in the web page appear the name of the company, some form request you that introduce your information or add files in system. It's adaptable and portable, the information can be transferred to many types of M languages, and they are easy to transport in different technologies.

Other thing is that they use XML that is means an extensible Markup language that for example the webs or the

big companies use tools like Google Translate for example to translate a file or a page in other languages. The XML allows the transportation storage retrieval data, complex data which is bases on a tree like rested structure.Furthermore, another important thing is that kind of platform requires too much manipulation for ad additional packages like software (we need to create a web server) or SQL (allow us to manipulate data in SQL) into a machine. We have to use a Mongoose for seeing all information and insert information in the data set.

Also, other good characteristics are the graphics that for example in a website they help us to navigate for it, and they create relations, for example in the social media. The memory is very important due to they are created to support a lot of traffic and give answer very quick in thousandths of a second and a good example is in data set that it help to do analyses in real time.

Finally, we can appreciate here some advantages that this service provide us : they are more flexible in relation to create a great solution to store data, they offer scale, support volumes of data and add more software services, and they guarantee high performance also. On the other hand, unfortunately we have some disadvantages such as:they not present a lot of atomic, consistency, integrity and durability, in relational with the other model and not match with SQL languages, too. Also, I would like to do emphasis in that the cloud bring us the easy way to share this data with determinate customers or uses, and it makes that a lot of people can work in the same time and in a way safe like in the international business.

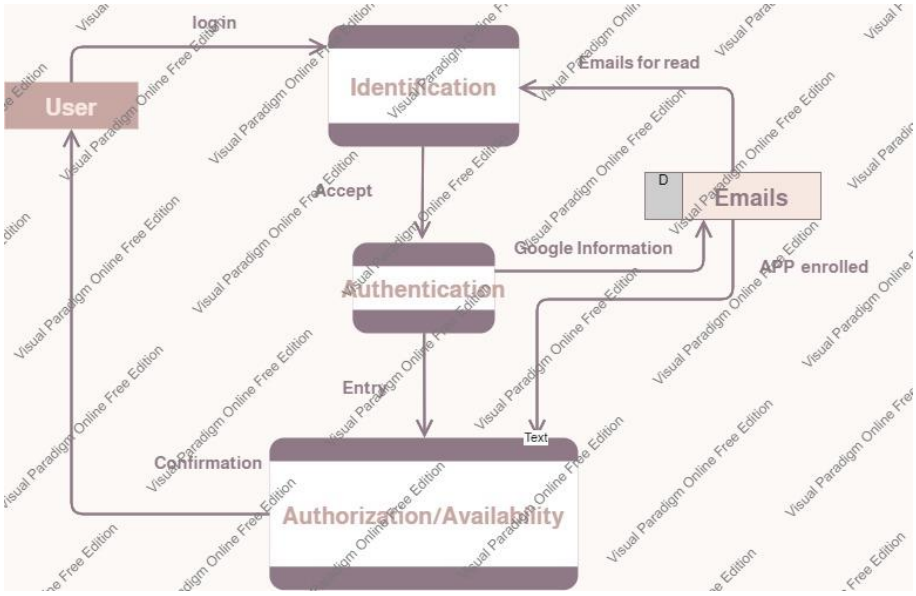
5. Differentiate between Authorisation and Authentication with a suitable example to elaborate. With the help of a suitable diagram, explain the various Database Security Levels and how Discretionary Access Control in SQL maintains security. Discuss why Availability is an important aspect of secure DBMS and how it can be ensured. [20 Marks, Maximum 600 Words]

Authentication is the act to check if the character that you introduce in a website match with the storage data, for example when you are already register in a webpage and introduce the next time the password, it means the app or system going to verify this information.

Authorization is the function to specific is you have the rights or the privileges to access at the recourses that you want to access.

Finally, the Availability is born in the CIA triad is a security concept, and it contents the 3 principals securities services that we must be in a safe environment. Apart from Availability, they are Confidentiality and Integrity. The Availability is so important due to denied the access to the service. They protect the access to the service that you want to entry, a very fast speed and a reasonable level of the performance. It is like it has the last word. A good way to guarantee the Availability is to implement backup systems to get the information in case that you lost it and recovery systems also.

Example:
Imagine that a user want to entry in a Google Account. The process is separated in steps:First, the customer click to log in, and the identification is check is the login is true. Secondly, Google request to the user a password and the program verify if the password match with the other that was introduced in the system (Authentication). If all is good, Google give permission for example read your email in your in-box.


login
User
Identification
Emails for read
Accept
D
Emails
Google Information
APP enrolled
Authentication
Entry
Text
Confirmation
Authorization/Availability