DBMS MINOR PROJECT

COURSE CODE:MC-209

MATHEMATICS AND COMPUTING

B.TECH 3rd SEMESTER

DELHI TECHNOLOGICAL UIVERSITY

DEPARTMENT APPLIED MATHEMATICS

SUBMITTED TO:- Ms.Himani Pokhriyal

SUBMITTED BY:- Lokesh Godara 23/MC/82

Krrishnav Gupta 23/MC/78

Acknowledgment

We are deeply grateful to Ms. Himani Pokhriyal for her invaluable mentorship and guidance throughout the course of our Hospital Management System project. This endeavor would not have been possible without her expertise, dedication, and encouragement. Ms. Pokhriyal's insightful feedback, patient guidance, and support provided us with the knowledge and confidence to navigate the challenges of this project, allowing us to refine our skills and better understand the intricacies of hospital management systems.

From the initial stages of planning to the final implementation, Ms. Pokhriyal's expertise helped us in making informed decisions, understanding complex requirements, and overcoming technical challenges. Her thorough approach to teaching and her readiness to offer assistance whenever needed created a supportive learning environment that encouraged us to give our best and strive for excellence.

Thank you, ma'am, for your invaluable contributions to our project and for your unwavering support. It has been a privilege to work under your guidance, and we are honored to have had the opportunity to learn from you.

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Abstract

The Hospital Management System (HMS) is designed to streamline and automate the processes within a hospital, ensuring efficient management of patient records, appointments, medical histories, staff, and resources. The system leverages a Database Management System (DBMS) to securely store, manage, and retrieve hospital-related data, providing an integrated platform for healthcare providers to manage essential functions and improve patient care quality.

The primary objective of the HMS is to enable seamless coordination between departments, reduce paperwork, and minimize human errors by centralizing data access. This system includes modules for patient registration, doctor and staff management, appointments, billing, inventory management, and reports generation. By adopting relational databases and enforcing database integrity and security constraints, the system ensures data consistency, confidentiality, and quick access for authorized users.

The HMS aims to facilitate real-time data processing, allowing medical professionals and administrative staff to perform their duties more effectively. In addition, it provides scalability to accommodate future growth and integration with other healthcare systems. The Hospital Management System thus serves as a comprehensive tool for improving operational efficiency, data accuracy, and patient satisfaction within a hospital setting.

Introduction

The **Hospital Management System (HMS)** project, developed by Lokesh Godara and Krrishnav, is designed to streamline and automate the essential processes within a hospital environment. Efficient management of patient records, scheduling, billing, and other administrative tasks is vital to delivering high-quality healthcare. This system provides a centralized platform that reduces paperwork, minimizes human error, and enhances coordination among departments, ultimately improving the patient experience.

Built with a focus on data integrity, security, and ease of use, the HMS incorporates key modules such as patient registration, doctor and staff management, appointment scheduling, billing, and inventory management. By using Database Management System (DBMS) principles, we have ensured that critical data is securely stored and readily accessible for authorized personnel. This system allows healthcare providers to retrieve and manage information quickly, enabling them to focus more on patient care.

In developing this project, we applied essential DBMS concepts, including normalization and transaction management, to ensure efficient data handling and high performance. The Hospital Management System is thus an effective tool for improving operational efficiency and enhancing the quality of care within a hospital.

No. Of Experiments	Name of Experiment	Date	Signature
1	System Design of the Project, along with its E-R Diagram	6/08/2024	
2	Implement the following DDL statements: a. Create b. Create table with constraints (NOT NULL, UNIQUE, DEFAULT, CHECK, PRIMARY KEY, FOREIGN KEY) c. Alter Table: i. Add column ii. Drop column iii. Add/drop constraint iv. Rename column d. Drop Table	13/08/24	
3	Implement the following DML statements: a. Insert b. Update c. Delete d. Truncate	20/08/24	
4	Implement the following SELECT statements: a. Simple SELECT statement b. Where clause+ IN/NOT IN c. Aggregate functions d. Group by + Having e. Order by f. Views g. Inbuilt Functions (e.g., Date)	27/08/24	

5	Implement and perform Nested Queries along with Joins (Inner join, Outer join, Left join, Right join)	3/09/24	
6	Introduction to PL/SQL. Create a PL/SQL block and implement the following: a. Variables	10/09/24	
	b. Packages c. Procedures d. Functions		
7	Perform Exception handling in a PL/SQL block.	8/10/24	
8	Project Report with Code and Screenshots	13/10/24	
9	Implement Triggers in SQL.	22/10/24	
10	Implement the following transaction statements: a. Commit b. Rollback c. Savepoint	22/10/24	

1.Sytem design of the Project, along with its E-R Diagram

Synopsis of Hospital Management System

Project Title: Hospital Management System (HMS)

Objective: The primary objective of this Hospital Management System (HMS) is to create a comprehensive database solution that manages the daily operations and administrative tasks of a hospital. This system aims to improve the efficiency and accuracy of various processes, including patient registration, appointment scheduling, medical records management, billing, and staff management.

Introduction: In the modern healthcare environment, hospitals face challenges such as managing patient data, scheduling appointments, and ensuring seamless communication among healthcare providers. The Hospital Management System seeks to address these challenges by providing a centralized platform that streamlines operations, enhances patient care, and optimizes resource management. **Key Features:**

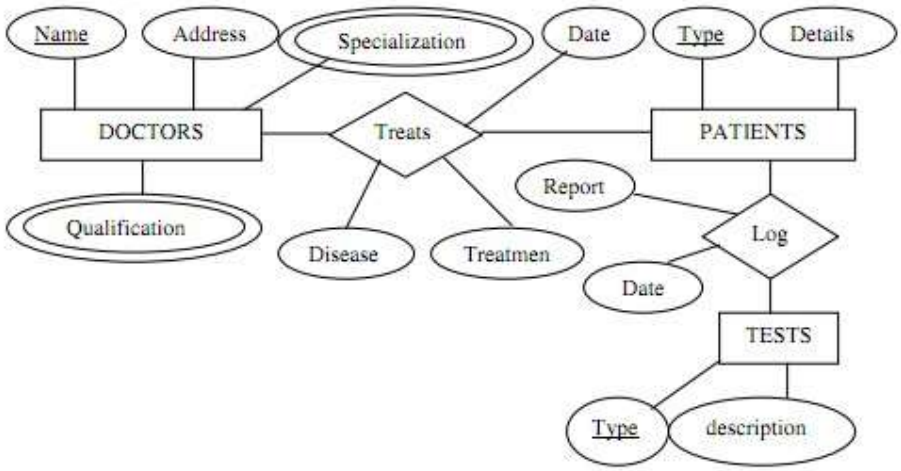
1. **Patient Registration:**
    - Collect and store patient information, including personal details, medical history, and contact information.
    - Assign a unique patient ID for easy identification.
2. **Appointment Scheduling:**
    - Allow patients to book appointments with doctors online.
    - Manage appointment availability and send reminders to patients.
3. **Medical Records Management:**
    - Maintain electronic medical records (EMRs) for each patient.
    - Facilitate easy access to patient history, diagnoses, treatments, and prescriptions.
4. **Billing and Invoicing:**
    - Automate the billing process for medical services rendered.
    - Generate invoices and manage payment records.

5. **Staff Management:**
    - Manage doctor, nurse, and administrative staff information.
    - Track staff schedules, availability, and performance.
6. **Reporting:**
    - Generate reports on patient statistics, financials, and operational efficiency. ○ Provide insights to aid decision-making and improve services.

Technologies Used:

- **Database Management System:** MySQL

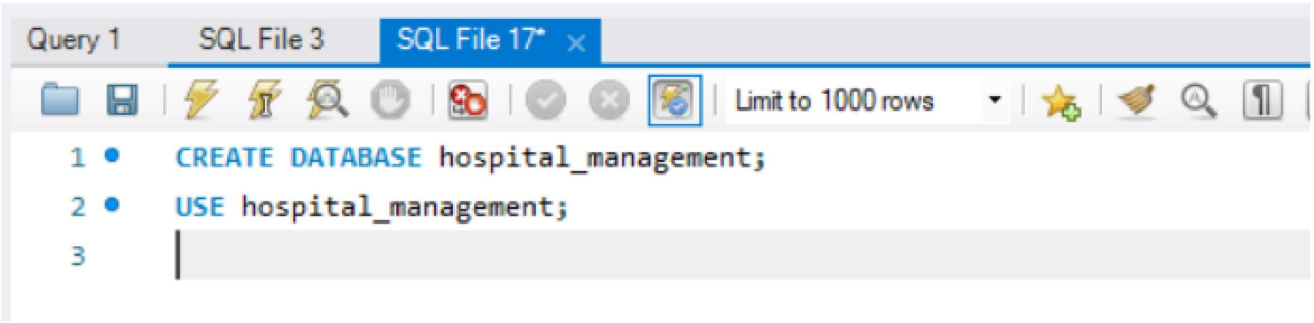
Conclusion: The Hospital Management System will significantly enhance the efficiency of hospital operations, improve patient experience, and ensure accurate management of medical records. By implementing a robust database solution, the system will facilitate better healthcare delivery, ultimately leading to improved patient outcomes.



2. ***Implement the following DDL statements: a. Create b. Create table with constraints (NOT NULL, UNIQUE, DEFAULT, CHECK, PRIMARY KEY, FOREIGN KEY) c. Alter Table:***

i. Add column ii. Drop column iii. Add/drop constraint iv. Rename column d. Drop Table

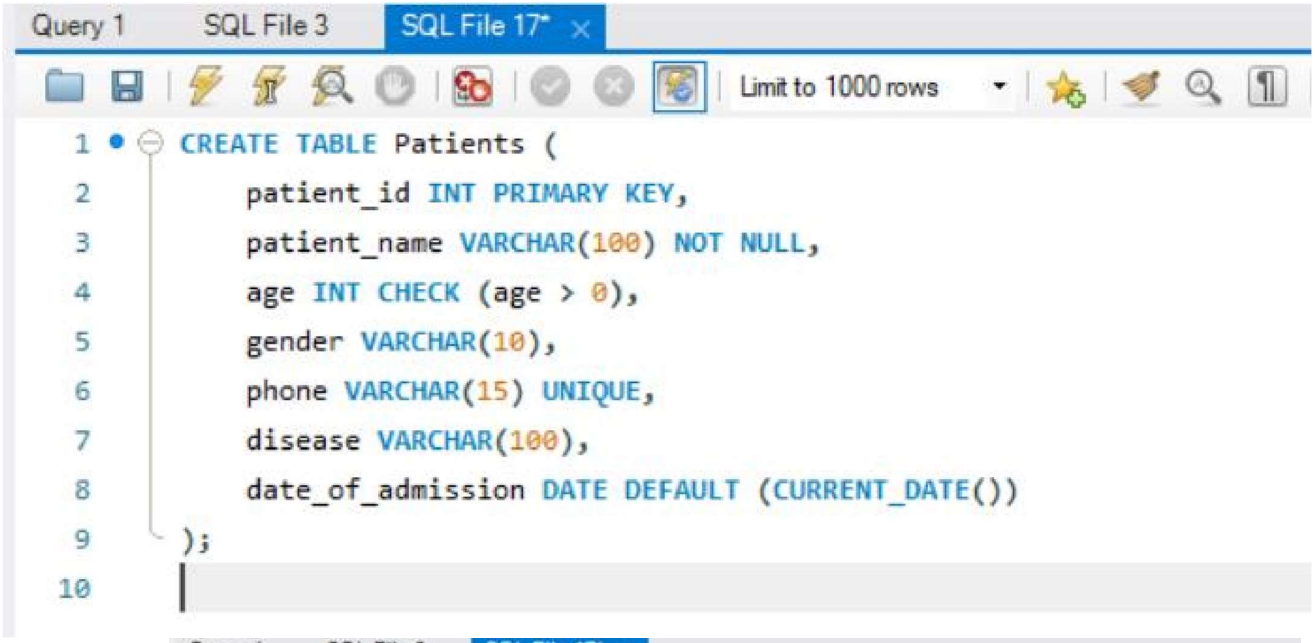
a. Create

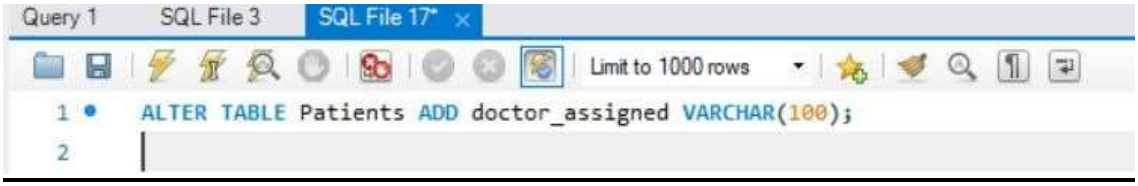


b. Create table with constraints (NOT NULL, UNIQUE, DEFAULT, CHECK, PRIMARY KEY, FOREIGN KEY)

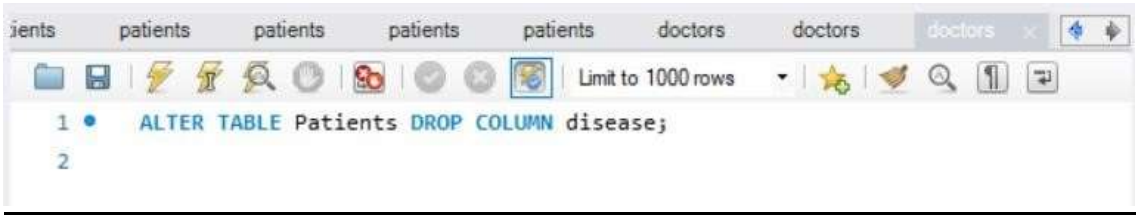
c. Alter Table:

i. Add column



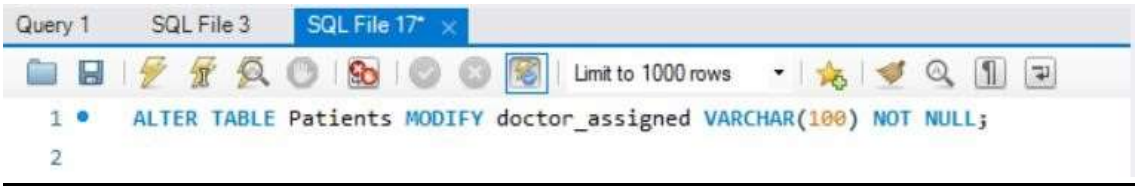


ii. Drop column

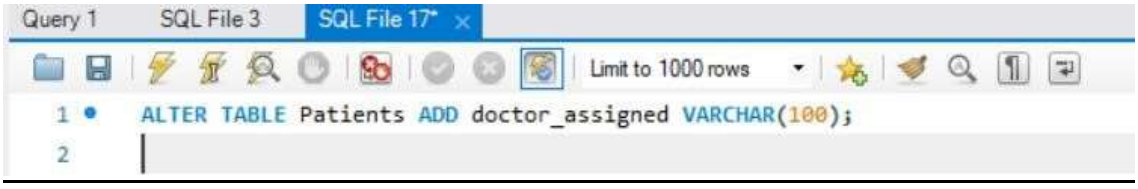


iii. Add/drop constraint

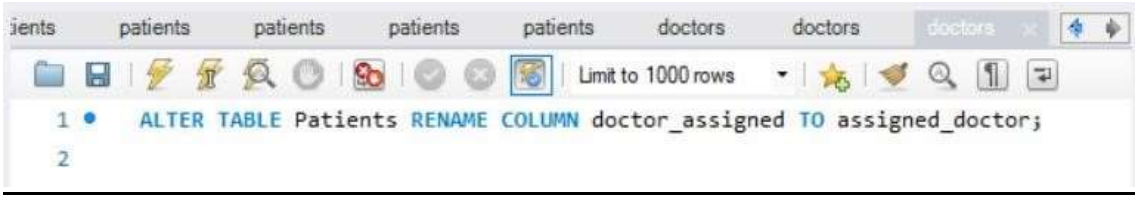
Add a NOT NULL constraint on doctor_assigned



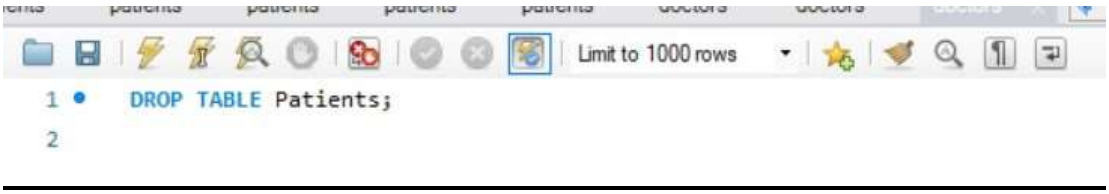
Drop the NOT NULL constraint



iv. Rename column



d. Drop Table



3.*Implement the following DML statements:*

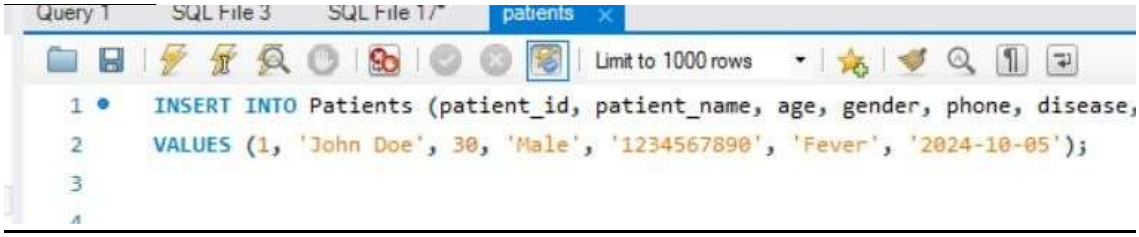
a. Insert

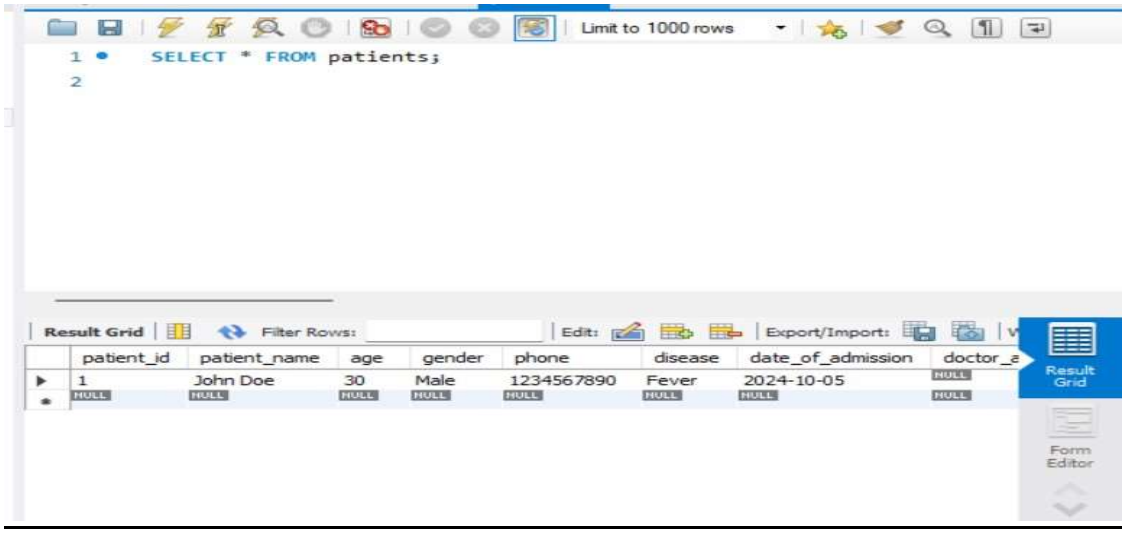
b. Update

c. Delete

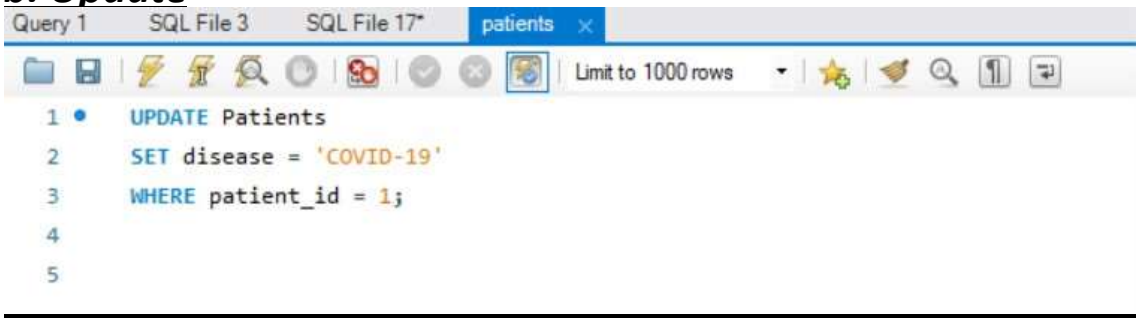
d. Truncate

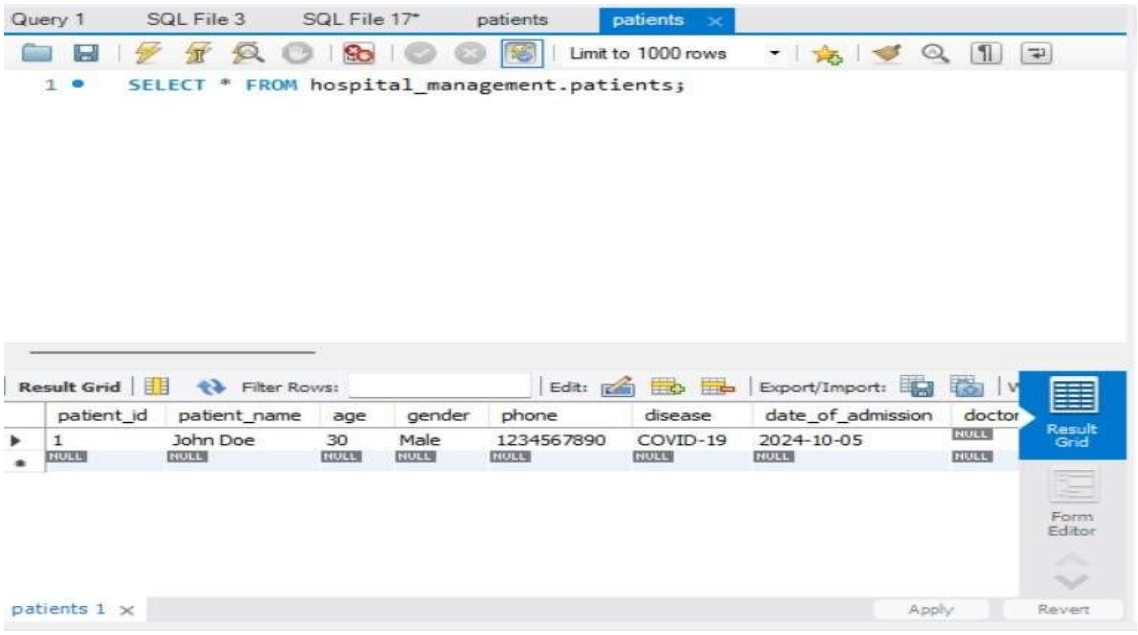
a. Insert



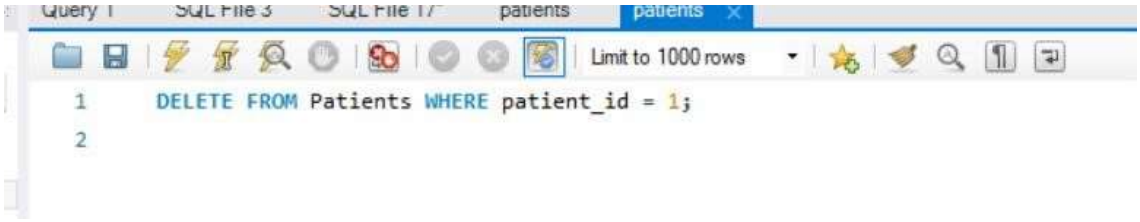


b. Update

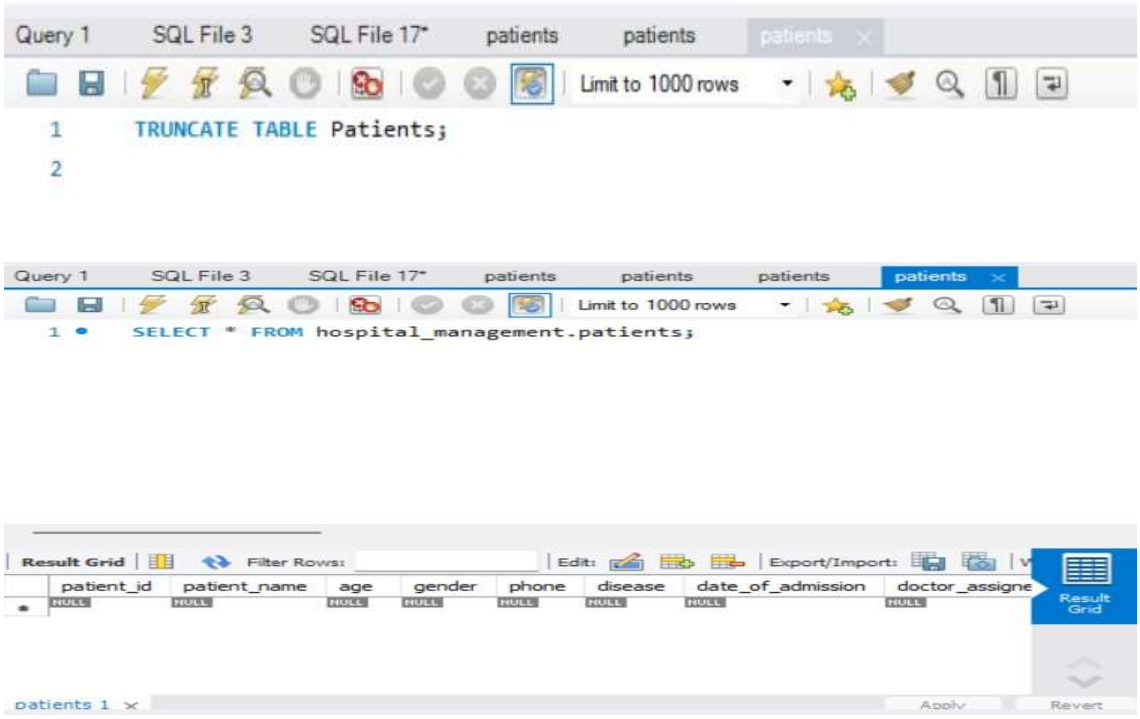


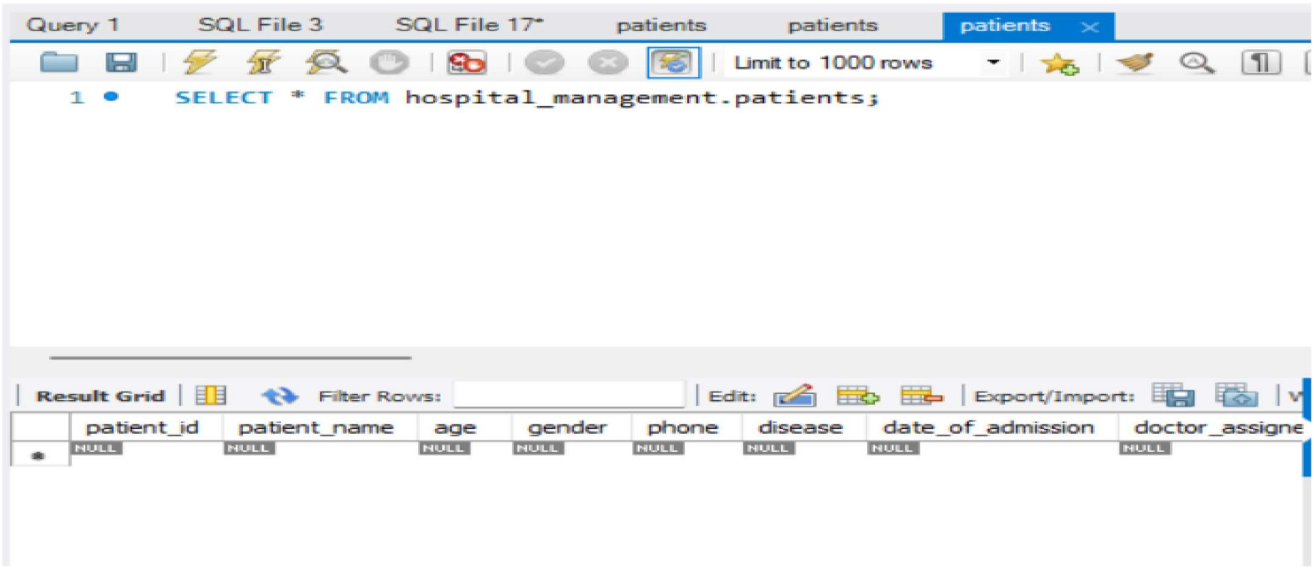


c. Delete



d. Truncate


Query 1
SQL File 3
SQL File 17*
patients
patients
patients
Limit to 1000 rows
1 TRUNCATE TABLE Patients;
2
Query 1
SQL File 3
SQL File 17*
patients
patients
patients
patients
Limit to 1000 rows
1 SELECT * FROM hospital_management.patients;
Result Grid
Filter Rows:
Edit:
Export/Import:
patient_id
patient_name
age
gender
phone
disease
date_of_admission
doctor_assigne
NULL
Result Grid
patients 1
Apply
Revert


Query 1
SQL File 3
SQL File 17*
patients
patients
patients
Limit to 1000 rows
1 SELECT * FROM hospital_management.patients;
Result Grid
Filter Rows:
Edit:
Export/Import:
patient_id
patient_name
age
gender
phone
disease
date_of_admission
doctor_assigne
NULL

Context Help | Snippets

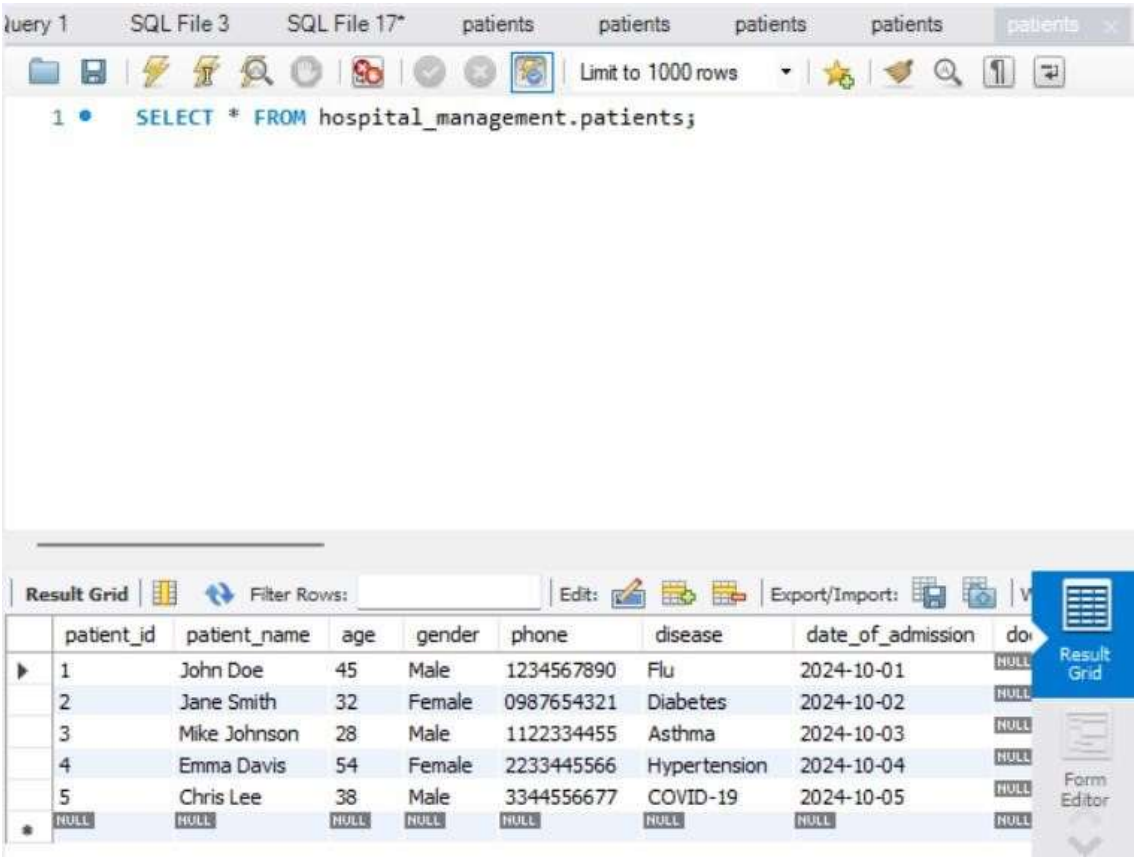
Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	13:10:40	SELECT * FROM patients LIMIT 0, 1000	0 row(s) returned	0.000 sec / 0.000 sec
2	13:11:47	INSERT INTO Patients (patient_id, patient_name, age, gender, phone, disease, date_...	1 row(s) affected	0.000 sec
3	13:11:58	INSERT INTO Patients (patient_id, patient_name, age, gender, phone, disease, date_...	Error Code: 1062. Duplicate entry '1' for key 'patients.PRIMARY'	0.000 sec
4	13:12:52	SELECT * FROM table_name LIMIT 0, 1000	Error Code: 1146. Table 'hospital_management.table_name' doesn't exist	0.000 sec
5	13:13:02	SELECT * FROM patients LIMIT 0, 1000	1 row(s) returned	0.000 sec / 0.000 sec
6	13:13:54	UPDATE Patients SET disease = 'COVID-19' WHERE patient_id = 1	1 row(s) affected Rows matched: 1 Changed: 1 Warnings: 0	0.016 sec
7	13:14:30	SELECT * FROM hospital_management.patients LIMIT 0, 1000	1 row(s) returned	0.000 sec / 0.000 sec
8	13:15:04	DELETE FROM Patients WHERE patient_id = 1	1 row(s) affected	0.000 sec
9	13:15:45	SELECT * FROM hospital_management.patients LIMIT 0, 1000	0 row(s) returned	0.000 sec / 0.000 sec
10	13:16:14	TRUNCATE TABLE Patients	0 row(s) affected	0.047 sec

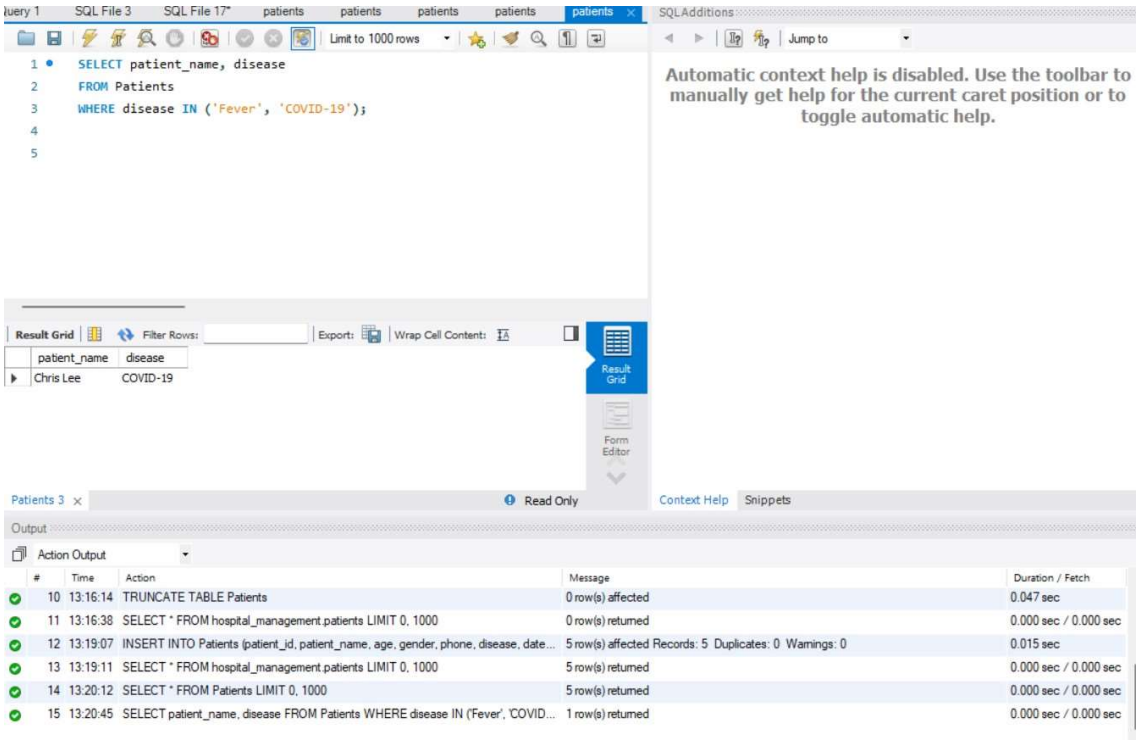
4- ***Implement the following SELECT statements: a. Simple SELECT statement***
b. Where clause+ IN/NOT IN
c. Aggregate functions
d. Group by + Having
e. Order by
f. Views
g. Inbuilt Functions (e.g., Date)

a. Simple SELECT statement



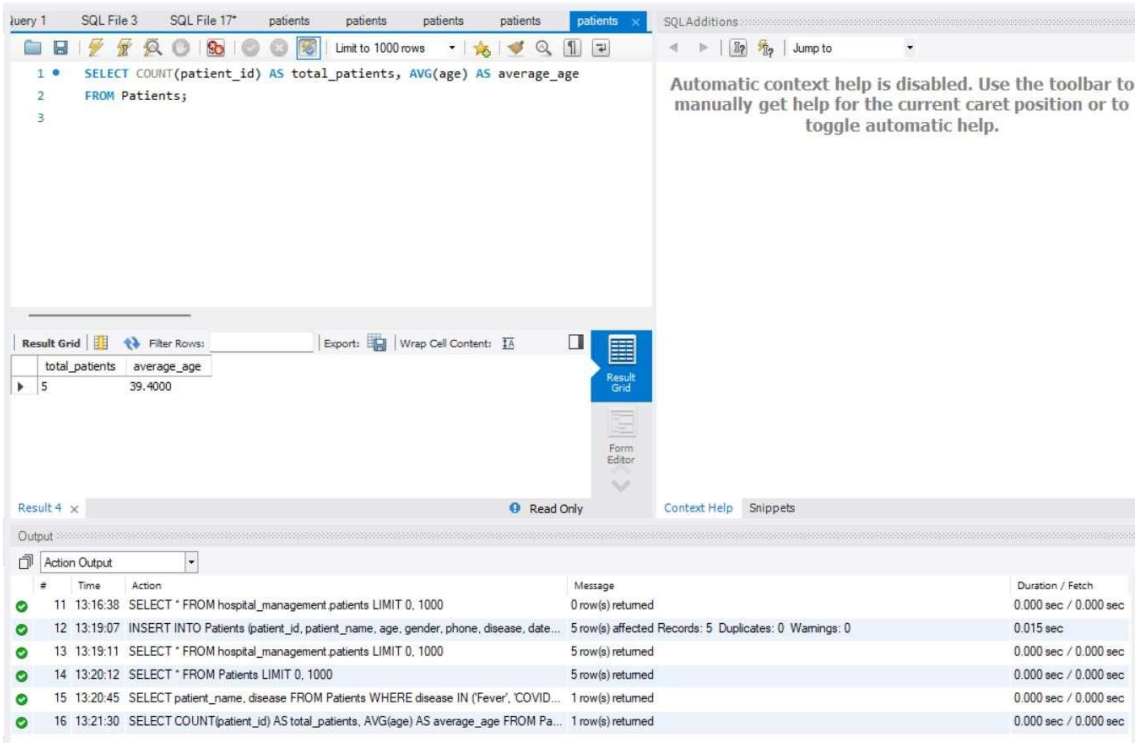
patient_id	patient_name	age	gender	phone	disease	date_of_admission
1	John Doe	45	Male	1234567890	Flu	2024-10-01
2	Jane Smith	32	Female	0987654321	Diabetes	2024-10-02
3	Mike Johnson	28	Male	1122334455	Asthma	2024-10-03
4	Emma Davis	54	Female	2233445566	Hypertension	2024-10-04
5	Chris Lee	38	Male	3344556677	COVID-19	2024-10-05

b. Where clause + IN/NOT IN:

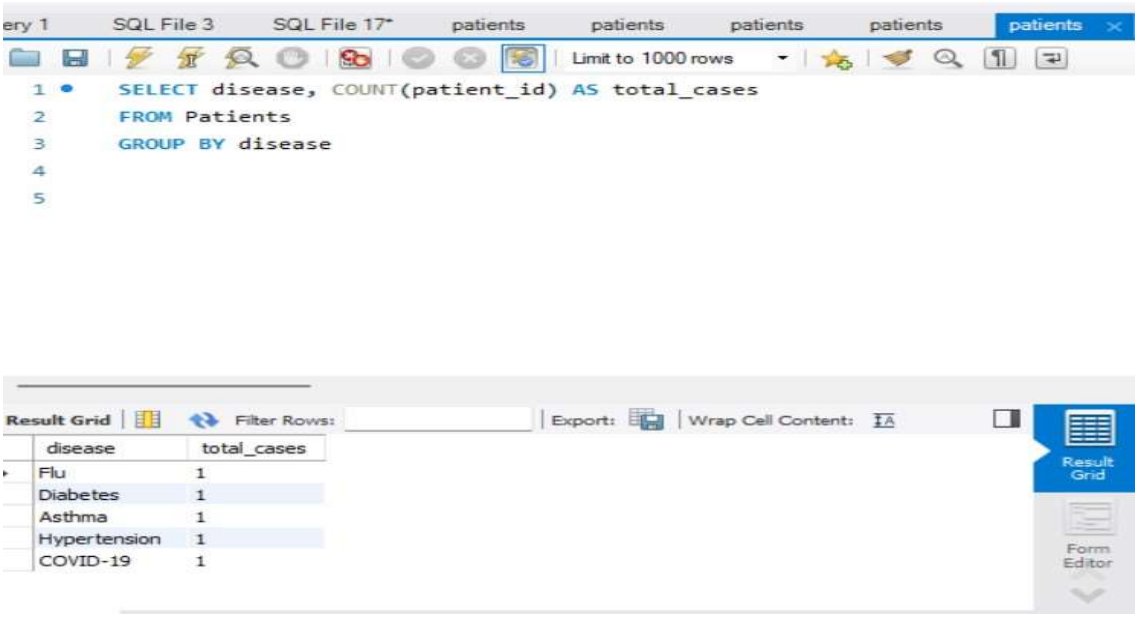


c. Aggregate Functions (e.g., COUNT, AVG):

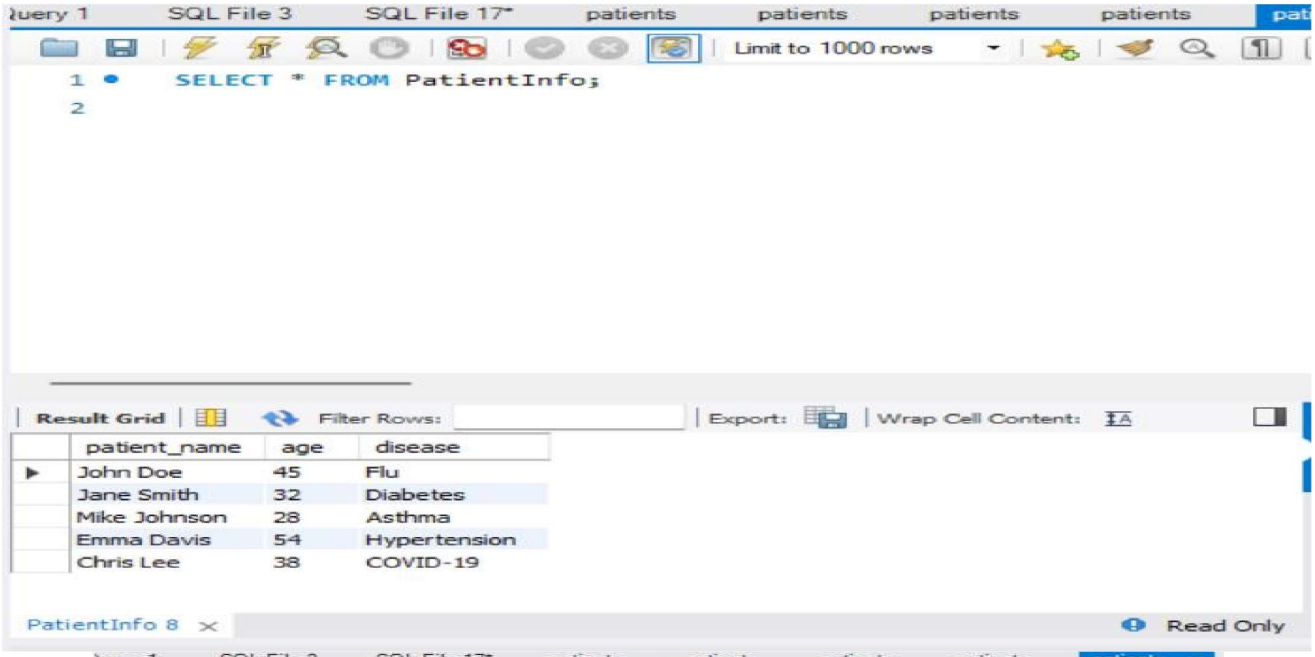
sql

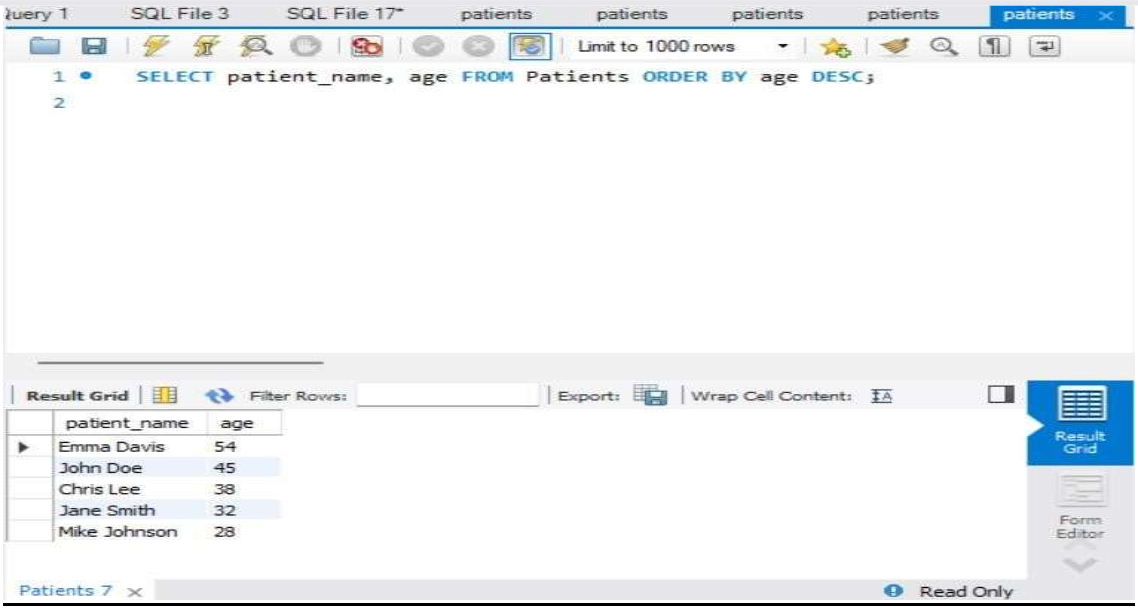


d. Group By + Having

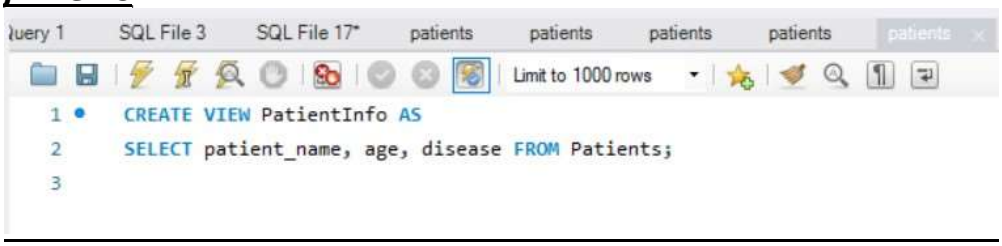


e. Order By

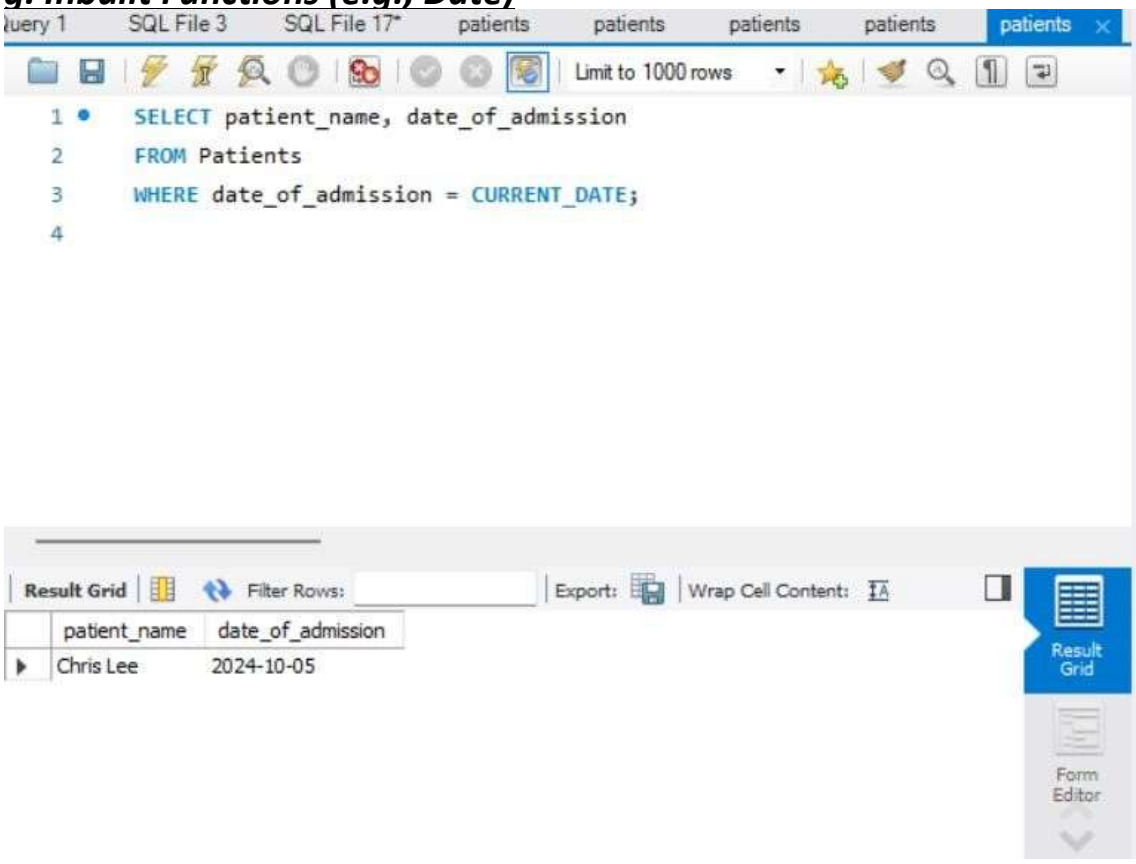

Query 1
SQL File 3
SQL File 17*
patients
patients
patients
patients
Limit to 1000 rows
1 SELECT * FROM PatientInfo;
2
Result Grid
Filter Rows:
Export:
Wrap Cell Content:
patient_name age disease
John Doe 45 Flu
Jane Smith 32 Diabetes
Mike Johnson 28 Asthma
Emma Davis 54 Hypertension
Chris Lee 38 COVID-19
PatientInfo 8
Read Only


Query 1
SQL File 3
SQL File 17*
patients
patients
patients
patients
patients
Limit to 1000 rows
1 SELECT patient_name, age FROM Patients ORDER BY age DESC;
2
Result Grid
Filter Rows:
Export:
Wrap Cell Content:
patient_name age
Emma Davis 54
John Doe 45
Chris Lee 38
Jane Smith 32
Mike Johnson 28
Result Grid
Form Editor
Patients 7
Read Only

f. Views

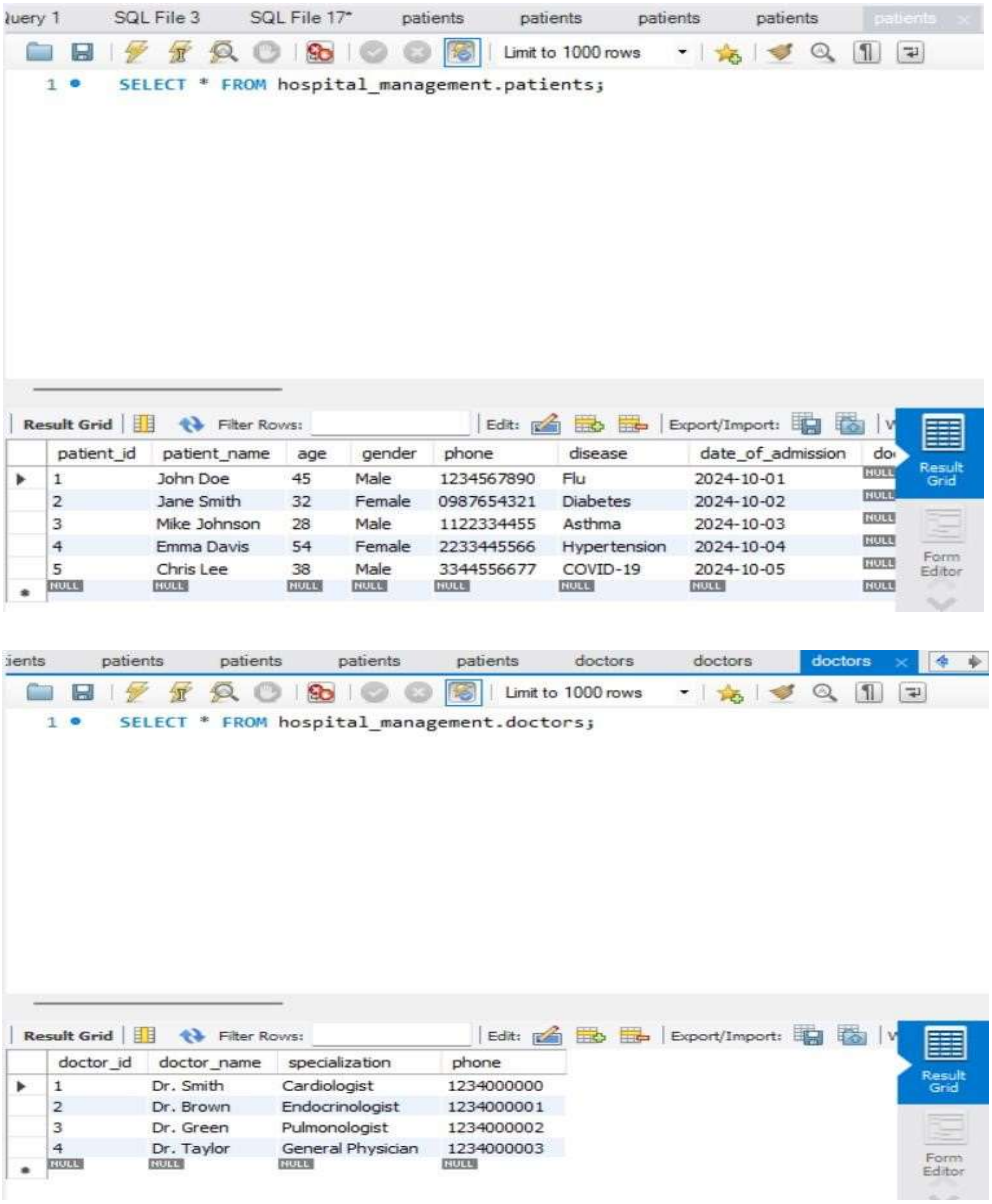

Query 1
SQL File 3
SQL File 17*
patients
patients
patients
patients
patients
Limit to 1000 rows
1 CREATE VIEW PatientInfo AS
2 SELECT patient_name, age, disease FROM Patients;
3

g. Inbuilt Functions (e.g., Date)



5- Implement and perform Nested Queries along with Joins (Inner join, Outer join, Left join, Right join)

We have 2 tables named Patients and doctors



Add a doctor_id to the Patients Table (for relational queries)

We need to update the Patients table to include a reference to the Doctors table, linking patients to doctors using a foreign key.

```sql
ALTER TABLE Patients
ADD doctor_id INT,
ADD FOREIGN KEY (doctor_id) REFERENCES Doctors(doctor_id);
```

Update Patient Records to Assign Doctors

```sql
UPDATE Patients
SET doctor_id = 1 WHERE disease = 'Hypertension';
UPDATE Patients
SET doctor_id = 2 WHERE disease = 'Diabetes';
UPDATE Patients
SET doctor_id = 3 WHERE disease = 'Asthma';
UPDATE Patients
SET doctor_id = 4 WHERE disease = 'Flu';
UPDATE Patients
SET doctor_id = 4 WHERE disease = 'COVID-19';
```

Nested Queries

```sql
SELECT patient_name, age, disease
FROM Patients
WHERE doctor_id = (SELECT doctor_id FROM Doctors WHERE specialization = 'Card
```

patient_name	age	disease
Emma Davis	54	Hypertension

Inner join

```
SELECT P.patient_name, P.age, P.disease, D.doctor_name, D.specialization
FROM Patients P
INNER JOIN Doctors D ON P.doctor_id = D.doctor_id;
```

Result Grid

patient_name	age	disease	doctor_name	specialization
John Doe	45	Flu	Dr. Taylor	General Physician
Jane Smith	32	Diabetes	Dr. Brown	Endocrinologist
Mike Johnson	28	Asthma	Dr. Green	Pulmonologist
Emma Davis	54	Hypertension	Dr. Smith	Cardiologist
Chris Lee	38	COVID-19	Dr. Taylor	General Physician

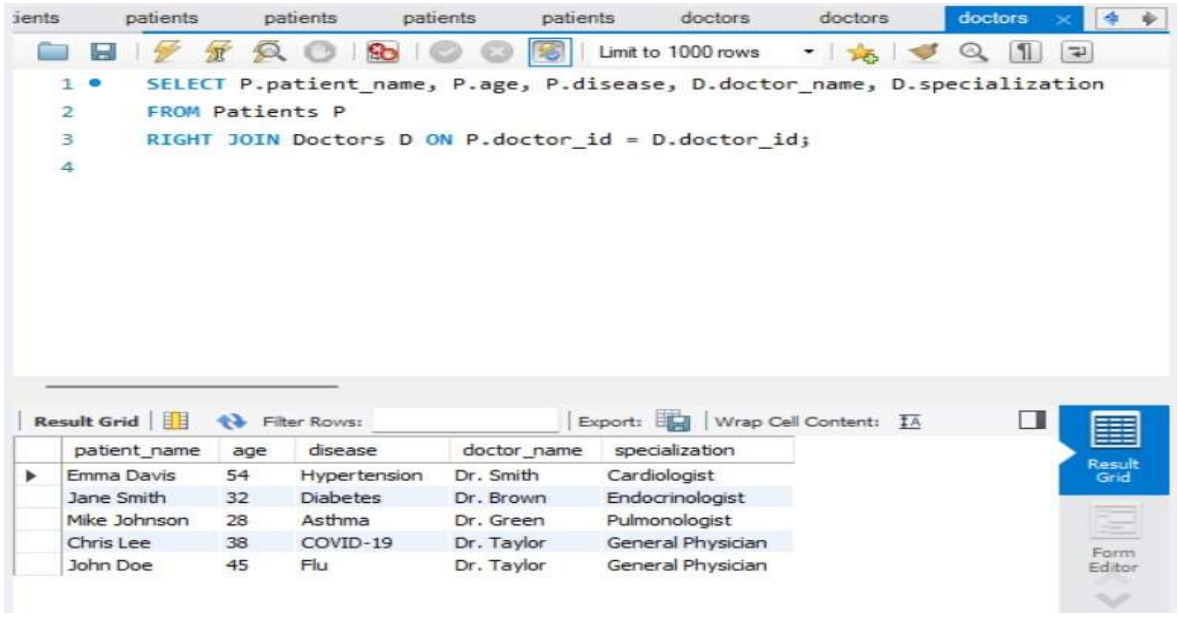
Left join

```
SELECT P.patient_name, P.age, P.disease, D.doctor_name, D.specialization
FROM Patients P
LEFT JOIN Doctors D ON P.doctor_id = D.doctor_id;
```

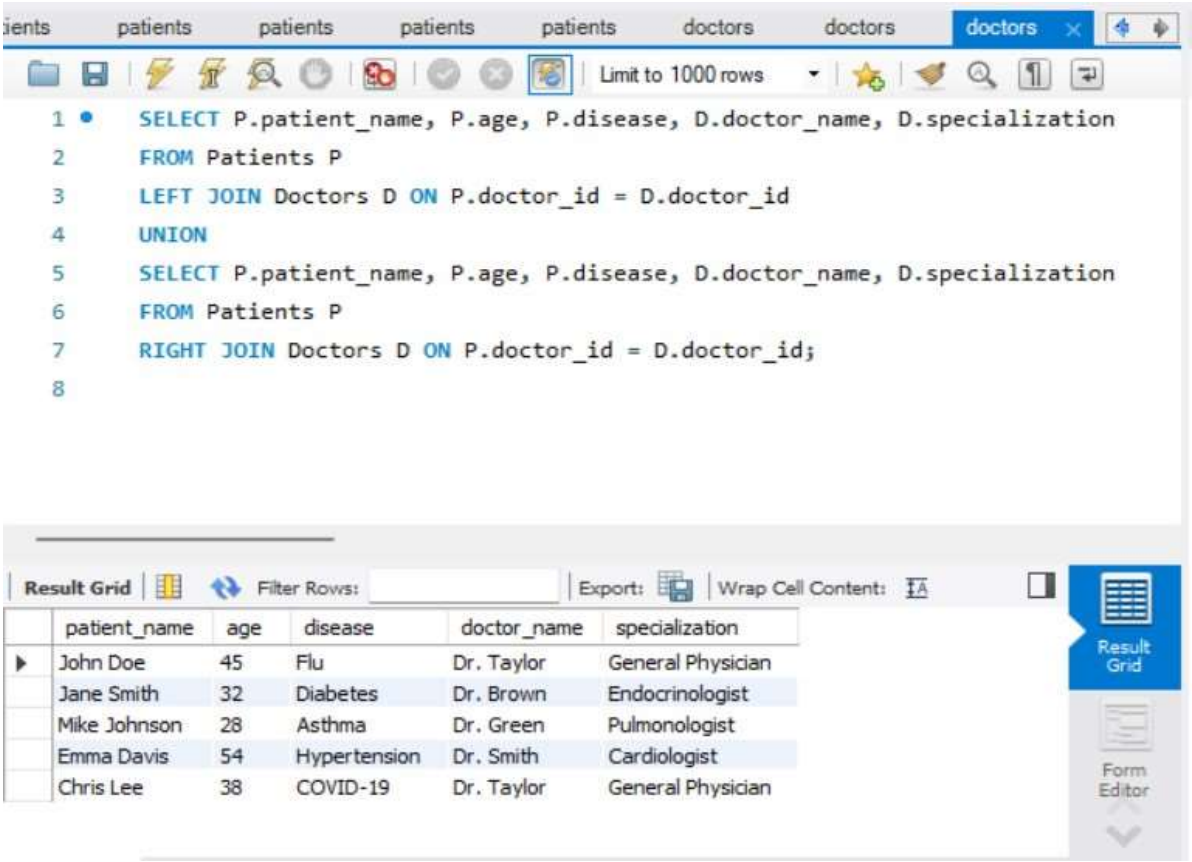
Result Grid

patient_name	age	disease	doctor_name	specialization
John Doe	45	Flu	Dr. Taylor	General Physician
Jane Smith	32	Diabetes	Dr. Brown	Endocrinologist
Mike Johnson	28	Asthma	Dr. Green	Pulmonologist
Emma Davis	54	Hypertension	Dr. Smith	Cardiologist
Chris Lee	38	COVID-19	Dr. Taylor	General Physician

Right join

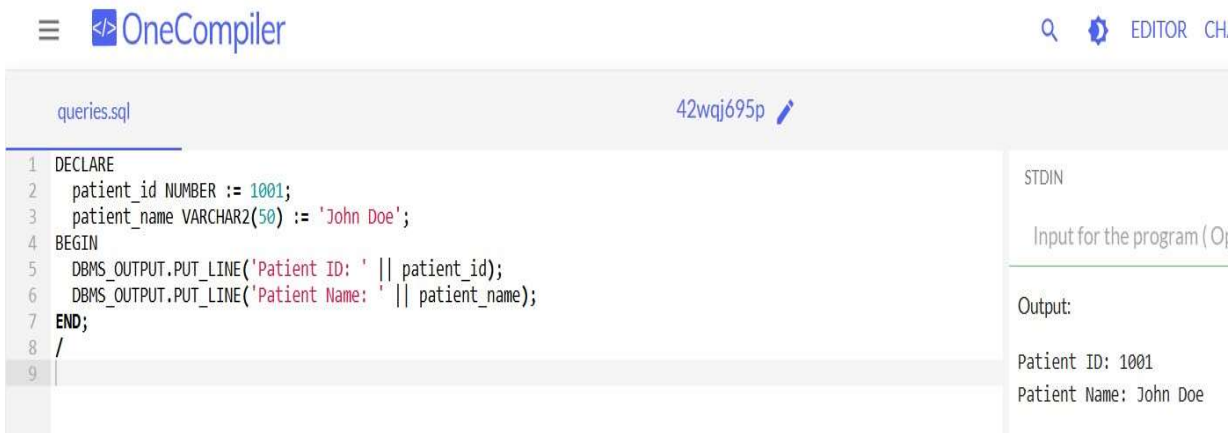

patients
patients
patients
patients
doctors
doctors
doctors
Limit to 1000 rows
1 SELECT P.patient_name, P.age, P.disease, D.doctor_name, D.specialization
2 FROM Patients P
3 RIGHT JOIN Doctors D ON P.doctor_id = D.doctor_id;
4
Result Grid
Filter Rows:
Export:
Wrap Cell Content:
patient_name age disease doctor_name specialization
Emma Davis 54 Hypertension Dr. Smith Cardiologist
Jane Smith 32 Diabetes Dr. Brown Endocrinologist
Mike Johnson 28 Asthma Dr. Green Pulmonologist
Chris Lee 38 COVID-19 Dr. Taylor General Physician
John Doe 45 Flu Dr. Taylor General Physician
Result Grid
Form Editor

Outer join

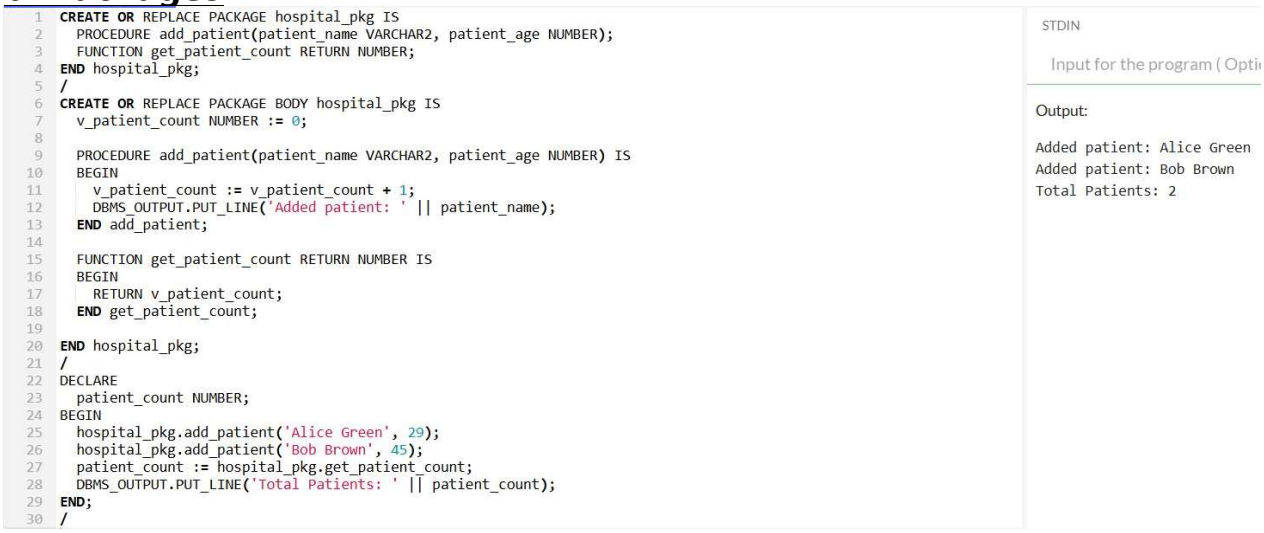

patients
patients
patients
patients
doctors
doctors
doctors
Limit to 1000 rows
1 SELECT P.patient_name, P.age, P.disease, D.doctor_name, D.specialization
2 FROM Patients P
3 LEFT JOIN Doctors D ON P.doctor_id = D.doctor_id
4 UNION
5 SELECT P.patient_name, P.age, P.disease, D.doctor_name, D.specialization
6 FROM Patients P
7 RIGHT JOIN Doctors D ON P.doctor_id = D.doctor_id;
8
Result Grid
Filter Rows:
Export:
Wrap Cell Content:
patient_name age disease doctor_name specialization
John Doe 45 Flu Dr. Taylor General Physician
Jane Smith 32 Diabetes Dr. Brown Endocrinologist
Mike Johnson 28 Asthma Dr. Green Pulmonologist
Emma Davis 54 Hypertension Dr. Smith Cardiologist
Chris Lee 38 COVID-19 Dr. Taylor General Physician
Result Grid
Form Editor

6-Introduction to PL/SQL. Create a PL/SQL block and implement the following: a. Variables b. Packages c. Procedures d. Functions

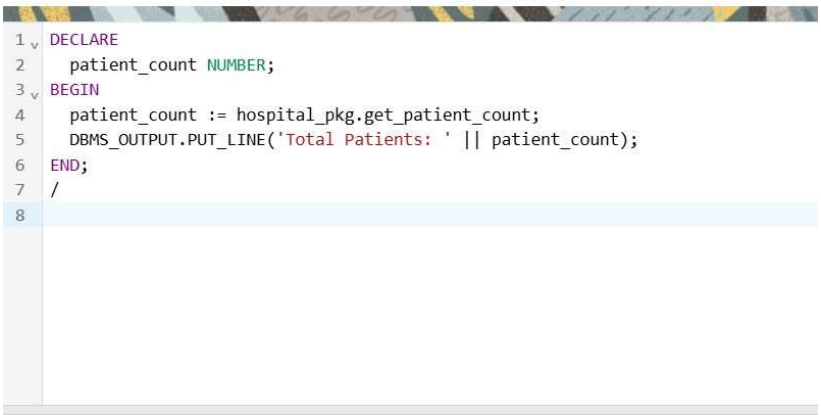
a. Variables



b. Packages



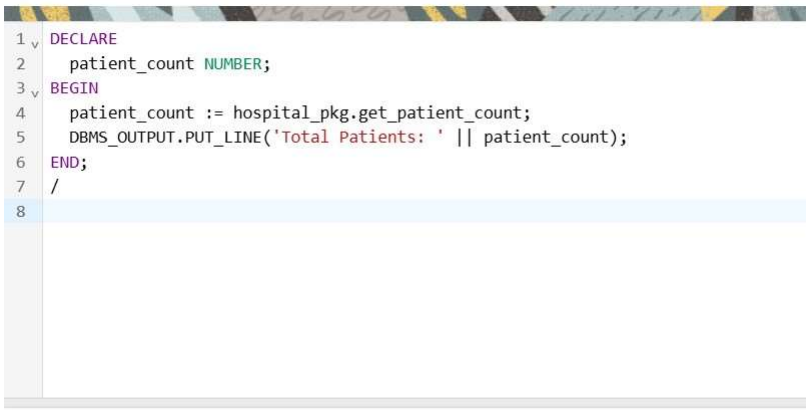
c. Procedures



```
DECLARE
  patient_count NUMBER;
BEGIN
  patient_count := hospital_pkg.get_patient_count;
  DBMS_OUTPUT.PUT_LINE('Total Patients: ' || patient_count);
END;
/
```

```
Statement processed.
Total Patients: 0
```

d. Functions



```
DECLARE
  patient_count NUMBER;
BEGIN
  patient_count := hospital_pkg.get_patient_count;
  DBMS_OUTPUT.PUT_LINE('Total Patients: ' || patient_count);
END;
/
```

```
Statement processed.
Total Patients: 0
```

7-Perform Exception handling in a PL/SQL block.

```
DECLARE
  patient_id NUMBER := 1;            -- Example patient ID
  patient_name VARCHAR2(50);         -- Variable to hold patient name
  age NUMBER := 0;                   -- Example variable for division by zero
  result NUMBER;
BEGIN
  -- Attempt to retrieve patient name
  SELECT name INTO patient_name
  FROM patients
  WHERE id = patient_id;

  -- Display patient name
  DBMS_OUTPUT.PUT_LINE('Patient Name: ' || patient_name);

  -- Example of division by zero to trigger an exception
  result := 100 / age;
  DBMS_OUTPUT.PUT_LINE('Result: ' || result);

EXCEPTION
  -- Handle the NO_DATA_FOUND exception
  WHEN NO_DATA_FOUND THEN
    DBMS_OUTPUT.PUT_LINE('Error: Patient with ID ' || patient_id || ' was not found.');
```

```
  -- Example of division by zero to trigger an exception
  result := 100 / age;
  DBMS_OUTPUT.PUT_LINE('Result: ' || result);

EXCEPTION
  -- Handle the NO_DATA_FOUND exception
  WHEN NO_DATA_FOUND THEN
    DBMS_OUTPUT.PUT_LINE('Error: Patient with ID ' || patient_id || ' was not found.');

  -- Handle division by zero
  WHEN ZERO_DIVIDE THEN
    DBMS_OUTPUT.PUT_LINE('Error: Division by zero occurred.');

  -- Handle any other exception
  WHEN OTHERS THEN
    DBMS_OUTPUT.PUT_LINE('An unexpected error occurred: ' || SQLERRM);
END;
/
```

```
Statement processed.
Patient Name: Alice Green
Error: Division by zero occurred.
```

-9

Implement Triggers in SQL.

Step 1: Create the Trigger

```
DELIMITER $$

CREATE TRIGGER set_default_age
BEFORE INSERT ON Patients
FOR EACH ROW
BEGIN
    IF NEW.age IS NULL THEN
        SET NEW.age = 30;
    END IF;
END$$

DELIMITER ;
```

Step 2: Insert Data

```
INSERT INTO Patients (patient_id, patient_name, gender, phone, disease, date_of_admission)
VALUES (6, 'John Doe', 'Male', '1234567891', 'Flu', CURRENT_DATE());
```

```
INSERT INTO Patients (patient_id, patient_name, age, gender, phone, disease, date_of_admission)
VALUES (7, 'Jane Doe', NULL, 'Female', '0987654371', 'Cold', CURRENT_DATE());
```

Step 3: Verify the Output

```
SELECT * FROM Patients WHERE patient_id IN (6, 7);
```

Result Grid

patient_id	patient_name	age	gender	phone	disease	date_of_admission	doctor_assigned	doctor_id
6	John Doe	30	Male	1234567891	Flu	2024-10-20	NULL	NULL
7	Jane Doe	30	Female	0987654371	Cold	2024-10-20	NULL	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

-10

Implement the following transaction statements:

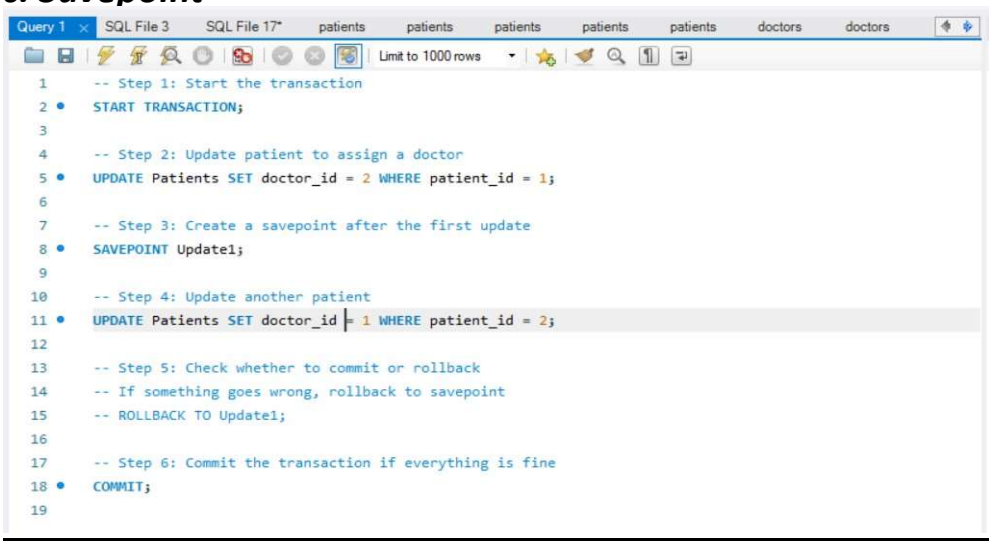
a. Commit

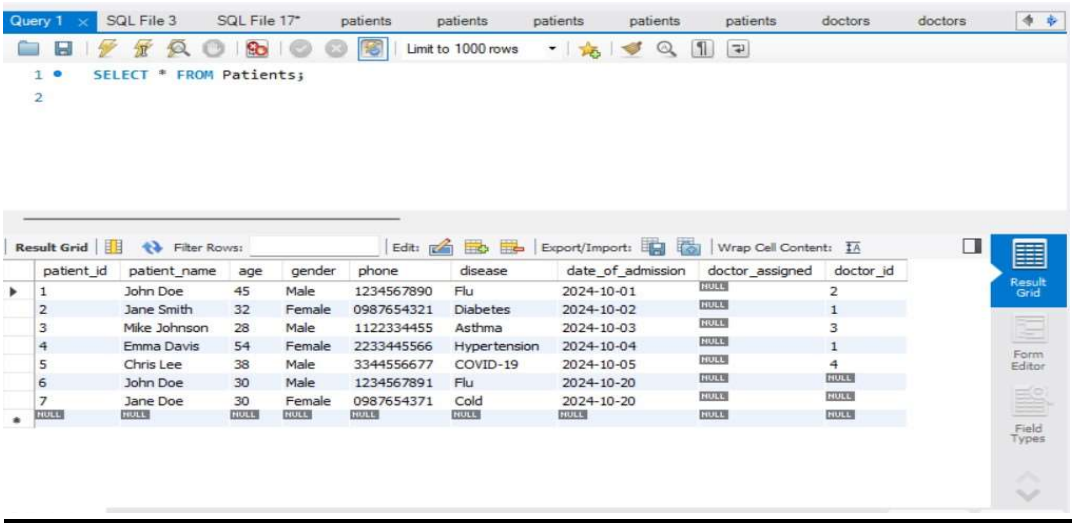
b. Rollback

c. Savepoint

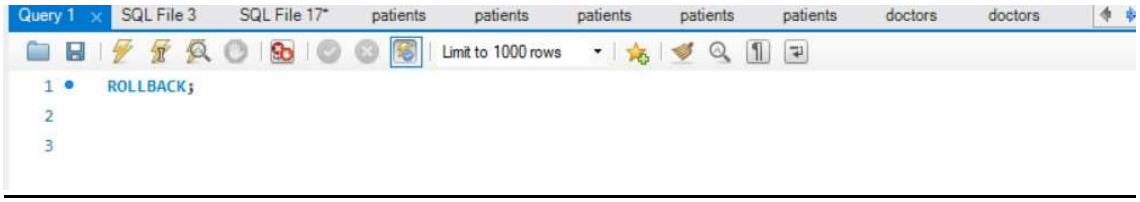
a. Commit

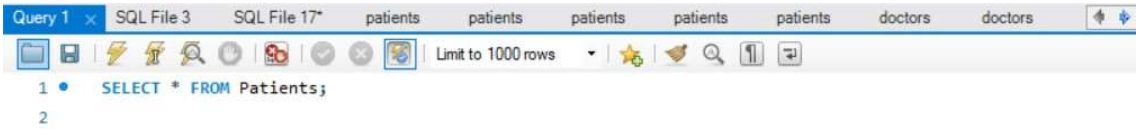
c. Savepoint

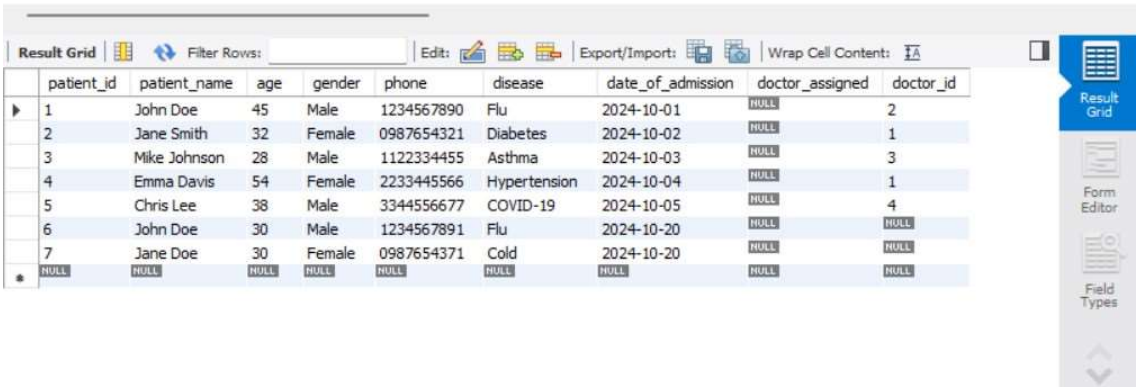




b. Rollback







patient_id	patient_name	age	gender	phone	disease	date_of_admission	doctor_assigned	doctor_id
1	John Doe	45	Male	1234567890	Flu	2024-10-01	NULL	2
2	Jane Smith	32	Female	0987654321	Diabetes	2024-10-02	NULL	1
3	Mike Johnson	28	Male	1122334455	Asthma	2024-10-03	NULL	3
4	Emma Davis	54	Female	2233445566	Hypertension	2024-10-04	NULL	1
5	Chris Lee	38	Male	3344556677	COVID-19	2024-10-05	NULL	4
6	John Doe	30	Male	1234567891	Flu	2024-10-20	NULL	NULL
7	Jane Doe	30	Female	0987654371	Cold	2024-10-20	NULL	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Testing and Validation

In this project, “Hospital Management System,” testing and validation were essential steps to ensure the accuracy, efficiency, and reliability of the database and the system’s functionality. The following tests were conducted to validate each component:

1. Unit Testing
   Each module of the database, including tables such as Patient, Appointment, MedicalRecord, and Staff, was tested individually to verify that they functioned correctly and stored data accurately. This involved inserting, updating, and deleting sample records to confirm each table’s response and data integrity.
   - Example Test: Adding a new Patient record and verifying its successful insertion in the Appointment and MedicalRecord tables.
   - Result: All tables were successfully populated and updated as per the requirements, with no data inconsistency observed.
2. Validation of Constraints
   Constraints such as primary keys, foreign keys, and unique constraints were rigorously tested to ensure that they enforced data integrity and prevented duplicate or invalid entries.
   - Example Test: Attempted insertion of a duplicate PatientID in the Patient table.
   - Result: Duplicate entries were effectively prevented, validating the uniqueness constraint.
3. Transaction Testing
   Transactions were tested using BEGIN TRANSACTION, COMMIT, and ROLLBACK to validate data handling during multiple operations. This ensured that data remained consistent in cases where some operations needed to be rolled back while others were committed.
   - Example Test: Multiple inserts into the Appointment and MedicalRecord tables, followed by a rollback to test partial changes.
   - Result: Rollbacks worked as expected, accurately reverting data to maintain integrity.
4. Validation of Queries and Reports
   All SQL queries were tested to ensure they returned accurate and expected results. Complex queries used for generating reports, such as patient admission statistics or doctor assignment summaries, were checked for accuracy and efficiency.
   - Example Test: Generating a report of patients currently admitted for inpatient care.

- Result: The queries returned accurate reports with the required details, confirming query correctness.

5. User Access Control Testing

   Access control was tested to ensure that only authorized users could perform specific actions within the system. Permissions were verified for roles with select access, insert access, and full privileges.

   - Example Test: Testing restricted access for a guest user attempting to modify data in the MedicalRecord table.
   - Result: The access control system prevented unauthorized modifications, ensuring data security.

Conclusion

The **Hospital Management System (HMS)** developed in this project provides a comprehensive solution for managing the complex and essential processes within a healthcare facility. By implementing this system, hospitals can streamline patient registration, appointment scheduling, medical records management, billing, and other administrative tasks, resulting in improved operational efficiency and enhanced patient care.

Throughout the project, database management concepts such as data integrity, constraints, transaction management, and access control were carefully applied to ensure that the system operates reliably and securely. The HMS enables healthcare providers to maintain accurate, up-to-date records and ensures that information is accessible only to authorized personnel, safeguarding patient confidentiality.

The project's testing and validation demonstrated the robustness of the system, ensuring data accuracy, reliability, and efficiency in handling hospital data. Additionally, the user-friendly design of the system allows healthcare staff to navigate the platform easily, reducing training time and minimizing human error.

In conclusion, this Hospital Management System stands as an effective tool for improving the quality of hospital administration. It not only reduces the workload of hospital staff but also contributes to a more seamless and efficient patient experience. Future enhancements, such as integration with other healthcare systems and telemedicine features, could further expand the capabilities of the system, adapting to the evolving needs of modern healthcare.