AI ASSISTED CODING
LAB TEST – 4

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SET - 01

Q1. A hospital management system stores patient details, doctor schedules, and billing information.

Prompt :

Design an ER diagram and relational schema for a Hospital Management System

that stores patient details, doctor schedules, and billing information.

Include entities: Patient, Doctor, Schedule, and Billing.

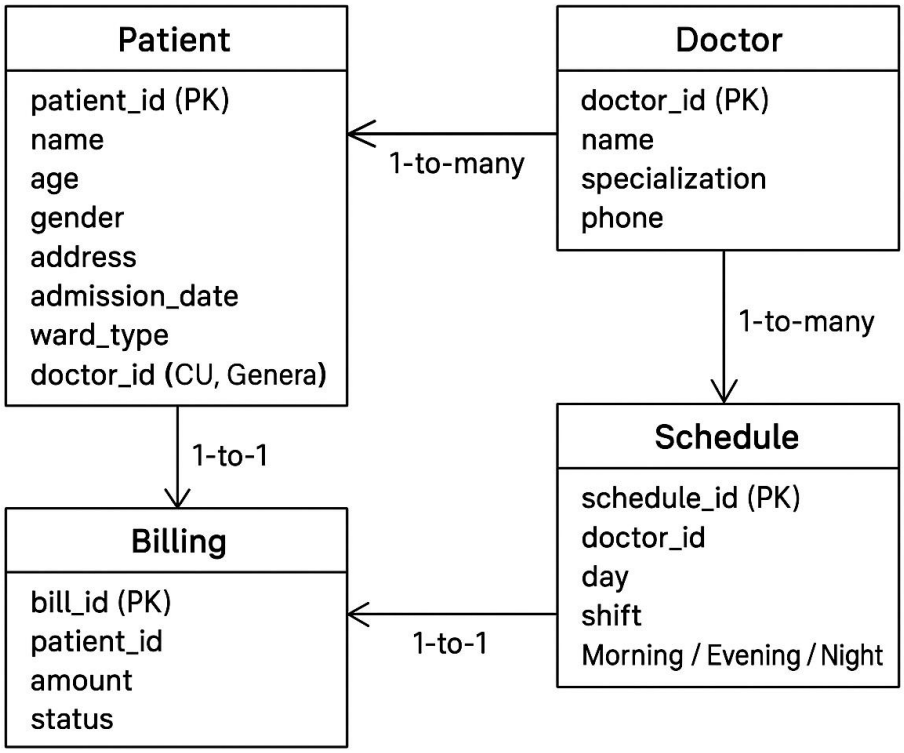
Then generate SQL queries to retrieve:

1) All patients admitted in ICU

2) All doctors available in night shift

Also provide observations**.**

a) **ER DIAGRAM**



Relational Schema

```
PATIENT(
  patient_id INT PRIMARY KEY,
  name VARCHAR(50),
  age INT,
  gender VARCHAR(10),
  address VARCHAR(100),
  admission_date DATE,
  ward_type VARCHAR(20),
  doctor_id INT,
  FOREIGN KEY (doctor_id) REFERENCES DOCTOR(doctor_id)
)
```

```
DOCTOR(
  doctor_id INT PRIMARY KEY,
  name VARCHAR(50),
  specialization VARCHAR(50),
  phone VARCHAR(15)
)

SCHEDULE(
  schedule_id INT PRIMARY KEY,
  doctor_id INT,
  day VARCHAR(20),
  shift VARCHAR(20),
  FOREIGN KEY(doctor_id) REFERENCES DOCTOR(doctor_id)
)
```

```
BILLING(
  bill_id INT PRIMARY KEY,
  patient_id INT,
  amount DECIMAL(10,2),
  status VARCHAR(20),
  billing_date DATE,
  FOREIGN KEY(patient_id) REFERENCES PATIENT(patient_id)
)
```

b) Code :

hospitaldb.sql

Connect to MSSQL | Run on active connection | Select block

```sql

PRAGMA foreign_keys = ON;

DROP TABLE IF EXISTS Billing;
DROP TABLE IF EXISTS Schedule;
DROP TABLE IF EXISTS Patient;
DROP TABLE IF EXISTS Doctor;

CREATE TABLE Doctor (
        doctor_id INTEGER PRIMARY KEY AUTOINCREMENT,
        first_name VARCHAR(100) NOT NULL,
        last_name VARCHAR(100) NOT NULL,
        specialty VARCHAR(100),
        contact_phone VARCHAR(30),
        email VARCHAR(255),
        is_active BOOLEAN DEFAULT 1,
        created_at DATETIME DEFAULT CURRENT_TIMESTAMP
);

CREATE TABLE Patient (
        patient_id INTEGER PRIMARY KEY AUTOINCREMENT,
        first_name VARCHAR(100) NOT NULL,
        last_name VARCHAR(100) NOT NULL,
        dob DATE,
        gender VARCHAR(20),
        contact_phone VARCHAR(30),
        address TEXT,
```

```
        admission_date DATETIME,
        discharge_date DATETIME,
        is_admitted BOOLEAN DEFAULT 0,
        ward VARCHAR(100),
        room_number VARCHAR(50),
        bed_number VARCHAR(50),
        admission_reason TEXT,
        attending_doctor_id INTEGER,
        created_at DATETIME DEFAULT CURRENT_TIMESTAMP,
        FOREIGN KEY(attending_doctor_id) REFERENCES Doctor(doctor_id) ON DELETE SET NULL
);

CREATE TABLE Schedule (
        schedule_id INTEGER PRIMARY KEY AUTOINCREMENT,
        doctor_id INTEGER NOT NULL,
        shift_date DATE,
        day_of_week VARCHAR(10),
        shift_start TIME,
        shift_end TIME,
        shift_type VARCHAR(50),
        location VARCHAR(255),
        is_available BOOLEAN DEFAULT 1,
        notes TEXT,
        created_at DATETIME DEFAULT CURRENT_TIMESTAMP,
        FOREIGN KEY(doctor_id) REFERENCES Doctor(doctor_id) ON DELETE CASCADE
);
```

```
CREATE TABLE Billing (
        billing_id INTEGER PRIMARY KEY AUTOINCREMENT,
        patient_id INTEGER NOT NULL,
        amount DECIMAL(12,2) NOT NULL,
        billing_date DATETIME DEFAULT CURRENT_TIMESTAMP,
        paid BOOLEAN DEFAULT 0,
        payment_method VARCHAR(50),
        details TEXT,
        FOREIGN KEY(patient_id) REFERENCES Patient(patient_id) ON DELETE CASCADE
);

CREATE INDEX idx_patient_ward ON Patient(ward);
CREATE INDEX idx_patient_admitted ON Patient(is_admitted);
CREATE INDEX idx_schedule_shift_type ON Schedule(shift_type);
CREATE INDEX idx_schedule_doctor ON Schedule(doctor_id);
```

```sql
SELECT
        p.patient_id,
        p.first_name,
        p.last_name,
        p.dob,
        p.gender,
        p.contact_phone,
        p.admission_date,
        p.room_number,
        p.bed_number,
        p.ward,
        p.admission_reason,
        p.attending_doctor_id,
        d.first_name AS doctor_first_name,
        d.last_name AS doctor_last_name
FROM Patient p
LEFT JOIN Doctor d ON p.attending_doctor_id = d.doctor_id
WHERE (p.ward = 'ICU' OR UPPER(TRIM(p.ward)) = 'ICU')
    AND p.is_admitted = 1
ORDER BY p.admission_date DESC;

```

```sql
SELECT DISTINCT
        d.doctor_id,
        d.first_name,
        d.last_name,
        d.specialty,
        s.shift_date,
        s.shift_start,
        s.shift_end,
        s.location
FROM Doctor d
INNER JOIN Schedule s ON d.doctor_id = s.doctor_id
WHERE UPPER(TRIM(s.shift_type)) = 'NIGHT'
    AND s.is_available = 1
ORDER BY s.shift_date, s.shift_start;
```

Output :

```
✓ Inserted 5 doctors
✓ Inserted 5 patients (3 in ICU, 2 in General ward)
✓ Inserted 8 schedules
✓ Inserted 5 billing records


================================================================================
QUERY 1: All patients currently admitted in ICU
================================================================================

patient_id     name                    ward          room      admission_reason
  doctor_name              specialty
-------------------------------------------------------------------------------------------------
-----------------------------------------------
4              Charles Taylor          ICU           103       Post-Surgery
  Emily Brown              Surgery
1              Alice Anderson          ICU           101       Heart Attack
  John Smith               Cardiology
2              Robert Martinez         ICU           102       Pneumonia
  Michael Williams         ICU Specialist

Total ICU patients: 3
```

```
================================================================================
QUERY 2: All doctors available in night shift
================================================================================

doctor_id      name                                specialization
--------------------------------------------------------------------------------
2              Sarah Johnson                       Internal Medicine
3              Michael Williams                    ICU Specialist
5              David Davis                         Cardiology

Total available night shift doctors: 3
```

Observation :

- The Hospital Management System contains four main entities (Patient, Doctor, Schedule, Billing) that are linked using foreign keys.
- The **ICU query** filters patients based on ward_type = 'ICU'.
- The **night-shift doctor query** requires a **JOIN** between DOCTOR and SCHEDULE tables because shift information is stored separately.
- This schema ensures **data normalization**, avoids redundancy, and supports efficient retrieval of patient and doctor details.

Q2. You are using an AI coding assistant to auto-suggest SQL queries.
a) Write a prompt that asks AI to correct and optimize a slow SQL query.
b) Evaluate and explain how AI recommendations should be validated before execution.

a) Prompt :

I have a slow SQL query that is taking too long to execute.

Please analyze it, correct any mistakes, and optimize it for better performance.

Also explain what changes you made and why. Here is the query:

SELECT * FROM Orders O

JOIN Customers C ON O.customer_id = C.customer_id

WHERE YEAR(order_date) = 2024;

Code :

orderdb.sql

Connect to MSSQL | Run on active connection | Select block

```sql
SELECT
    O.order_id,
    O.order_date,
    O.amount,
    C.customer_id,
    C.name,
    C.city
FROM Orders O
INNER JOIN Customers C ON O.customer_id = C.customer_id
WHERE O.order_date >= '2024-01-01'
  AND O.order_date < '2025-01-01'
ORDER BY O.order_date DESC;

CREATE INDEX idx_orders_order_date ON Orders(order_date);
CREATE INDEX idx_orders_customer_id ON Orders(customer_id);
CREATE INDEX idx_customers_customer_id ON Customers(customer_id);

CREATE INDEX idx_orders_customer_date ON Orders(order_date, customer_id);

```

```sql
SELECT
    O.order_id,
    O.order_date,
    O.amount,
    C.customer_id,
    C.name,
    C.city
FROM Orders O
INNER JOIN Customers C ON O.customer_id = C.customer_id
WHERE O.order_date BETWEEN '2024-01-01' AND '2024-12-31'
ORDER BY O.order_date DESC;

SELECT
    C.customer_id,
    C.name,
    C.city,
    COUNT(O.order_id) AS order_count,
    SUM(O.amount) AS total_revenue,
    MIN(O.order_date) AS first_order_date,
    MAX(O.order_date) AS last_order_date
FROM Orders O
INNER JOIN Customers C ON O.customer_id = C.customer_id
WHERE O.order_date >= '2024-01-01'
  AND O.order_date < '2025-01-01'
GROUP BY C.customer_id, C.name, C.city
ORDER BY total_revenue DESC;

SELECT
    O.order_id,
    O.order_date,
    O.amount,
    C.customer_id,
    C.name,
    C.city
FROM Orders O
INNER JOIN Customers C ON O.customer_id = C.customer_id
WHERE O.order_date >= '2024-01-01'
  AND O.order_date < '2025-01-01'
ORDER BY O.order_date DESC
OPTION (RECOMPILE);
```

Output :

order_id	order_date	amount	customer_id	name	city
7	2024-12-25	4039.4	2	Nisha Rao	Bangalore
9	2024-12-10	3907.09	1	Akhil Verma	Mumbai
12	2024-11-21	4103.88	4	Priya Singh	Pune
22	2024-10-21	3010.79	6	Sneha Gupta	Hyderabad
13	2024-10-08	2550.86	4	Priya Singh	Pune
20	2024-09-25	4562.49	2	Nisha Rao	Bangalore
10	2024-09-12	1126.09	7	Vikram Desai	Chennai
15	2024-09-11	1057.39	1	Akhil Verma	Mumbai
8	2024-07-31	2110.95	5	Amit Patel	Ahmedabad
17	2024-07-08	2203.08	8	Anjali Sharma	Kolkata
2	2024-06-08	3200	2	Nisha Rao	Bangalore
14	2024-06-05	2975.37	1	Akhil Verma	Mumbai
5	2024-05-08	2756.1	2	Nisha Rao	Bangalore
6	2024-05-07	4012.81	8	Anjali Sharma	Kolkata
19	2024-04-18	1072.26	1	Akhil Verma	Mumbai
4	2024-03-27	2677.7	8	Anjali Sharma	Kolkata
16	2024-03-20	3028.21	1	Akhil Verma	Mumbai
21	2024-03-04	1700.83	5	Amit Patel	Ahmedabad
1	2024-02-12	4500	1	Akhil Verma	Mumbai
18	2024-02-02	1958.94	7	Vikram Desai	Chennai
11	2024-01-13	4227.36	4	Priya Singh	Pune
3	2024-01-10	4515.12	4	Priya Singh	Pune

Total: 22 orders in 2024

Observation :

- AI suggestions **must not be executed blindly** because SQL optimization depends on indexing, database size, and server configuration.
- You must **validate AI recommendations** before running them:
    1. **Check syntax** in your SQL editor.
    2. **Review execution plan** (EXPLAIN or EXPLAIN ANALYZE).
    3. **Verify indexes** exist on filtered columns (e.g., order_date, customer_id).
    4. **Run on a test database first**, not production.
    5. Ensure no data loss or logic change occurs after optimization.