SQL Case Study ：Hospital Management System

Hospital Management System (HMS) is designed to streamline patient care, doctor interactions, diagnostic procedures, and administrative operations. It supports both outpatient (OPD) and inpatient (admitted) workflows, ensuring accurate tracking of medical services, billing, and diagnostics.

Core Entities and Relationships

1. Patient

- Represents individuals registered with the hospital.
- Can be either OPD or admitted.
- Only registered patients are eligible for blood tests and admissions.

2. Doctor

- Medical professionals with assigned specialties.
- Each doctor has a unique OPD consultation fee.

3. OPDVisit

- Records outpatient visits.
- Links a patient to a doctor on a specific date.
- Only registered patients can have OPD visits.

4. Admission

- Captures inpatient admissions.
- Only patients who have had an OPD visit can be admitted.
- Includes room type, which determines daily cost (₹1000, ₹2000, ₹3000).

5. Prescription

- Issued by doctors during OPD visits or admissions.
- Each prescription may include multiple blood tests.

6. BloodTest

- Diagnostic tests tied to prescriptions.
- Only registered patients can undergo blood tests.
- Multiple tests can be linked to a single prescription.

Business Logic Enforced

- Only registered patients appear in OPD, Admission, and BloodTest.
- Only OPD patients can be admitted.
- Blood tests are tied to prescriptions.

- Room types determine cost (logic can be added in queries).

Entity Relationship Summary

Relationship	Type	Description
Patient → OPDVisit	One-to-Many	A patient can have multiple OPD visits.
Patient → Admission	One-to-Many	A patient can be admitted multiple times (if OPD history exists).
Doctor → OPDVisit	One-to-Many	A doctor can see many patients.
Doctor → Prescription	One-to-Many	A doctor can issue multiple prescriptions.
Patient → Prescription	One-to-Many	A patient can receive multiple prescriptions.
Prescription → BloodTest	One-to-Many	A prescription can include multiple blood tests.
Patient → BloodTest (via Prescription)	Indirect	Only registered patients can have blood tests through prescriptions.

Business Rules

- Only registered patients can access services (OPD, Admission, Blood Tests).
- Admission is allowed only after an OPD visit.
- Room type determines daily cost:
    - General: ₹1000/day
    - Semi-Private: ₹2000/day
    - Private: ₹3000/day
- Blood tests must be tied to a valid prescription.
- Doctors have variable OPD fees based on specialty.

SQL Script for Tables

```
CREATE TABLE Patient (
  PatientID INT PRIMARY KEY,
  Name VARCHAR(100),
  Age INT,
  Gender VARCHAR(10),
  RegisteredDate DATE
);

CREATE TABLE Doctor (
  DoctorID INT PRIMARY KEY,
  Name VARCHAR(100),
  Specialty VARCHAR(50),
  OPDFee INT
);
CREATE TABLE OPDVisit (
  VisitID INT PRIMARY KEY,
  PatientID INT,
  DoctorID INT,
  VisitDate DATE,
  FOREIGN KEY (PatientID) REFERENCES Patient(PatientID),
  FOREIGN KEY (DoctorID) REFERENCES Doctor(DoctorID)
);
```

```
CREATE TABLE Admission (
  AdmissionID INT PRIMARY KEY,
  PatientID INT,
  RoomType VARCHAR(20), -- 'General', 'Semi-Private', 'Private'
  AdmissionDate DATE,
  DischargeDate DATE,
  FOREIGN KEY (PatientID) REFERENCES Patient(PatientID)
);
CREATE TABLE Prescription (
  PrescriptionID INT PRIMARY KEY,
  PatientID INT,
  DoctorID INT,
  PrescribedDate DATE,
  FOREIGN KEY (PatientID) REFERENCES Patient(PatientID),
  FOREIGN KEY (DoctorID) REFERENCES Doctor(DoctorID)
);
CREATE TABLE BloodTest (
  TestID INT PRIMARY KEY,
  PrescriptionID INT,
  TestName VARCHAR(50),
  TestDate DATE,
  Result VARCHAR(100),
  FOREIGN KEY (PrescriptionID) REFERENCES Prescription(PrescriptionID)
);
```

```
INSERT INTO Patient VALUES
(1, 'Amit Sharma', 34, 'Male', '2025-01-10'),
(2, 'Neha Verma', 28, 'Female', '2025-01-12'),
(3, 'Ravi Mehta', 45, 'Male', '2025-02-05');

INSERT INTO Doctor VALUES
(1, 'Dr. Kapoor', 'Cardiology', 500),
(2, 'Dr. Singh', Eyes, 700),
(3, 'Dr. Iyer', 'Neurology', 1000),
(4, 'Dr. Prem, 'General Medicine', 300),
(5, 'Dr. Das', ‘Derma’, 400);

INSERT INTO OPDVisit VALUES
(1, 1, 1, '2025-03-01'),
(2, 2, 2, '2025-03-02');

INSERT INTO Admission VALUES
(1, 1, 'Private', '2025-03-05', '2025-03-10'),
(2, 3, 'General', '2025-03-06', '2025-03-08');

INSERT INTO Prescription VALUES
(1, 1, 1, '2025-03-01'),
(2, 2, 2, '2025-03-02');

INSERT INTO BloodTest VALUES
(1, 1, 'CBC', '2025-03-01', 'Normal'),
(2, 1, 'Lipid Profile', '2025-03-01', 'High Cholesterol'),
(3, 2, 'Blood Sugar', '2025-03-02', 'Normal');
```

Implement the Following Query

- Patients who had blood tests
- Doctors who prescribed at least one blood test
- Patients who never got admitted
- Patients with more than 2 blood tests
- Doctors who never saw a patient in OPD
- Patients with highest number of OPD visits
- Most common blood test (order by)
- Patients who had blood tests but were never admitted
- Patients with both OPD and Admission records
- Number of Blood Tests per Patient
- Patients with Multiple Prescriptions and Tests
- Monthly OPD Revenue per Doctor
- Monthly Revenue by Admission
- Total Revenue per Doctor
- List all OPD visits with doctor and patient names
- Blood tests with patient and doctor info
- Admissions with patient name and room type
- Prescriptions with doctor specialty
- All patients with or without OPD visits
- All doctors with or without prescriptions
- Monthly Revenue by Doctor (OPD + Blood Tests + Admission)
- Avg Revenue from Patient Admission
- Patients with More Than 3 Blood Tests
- Patients Whose Admission Stay Was Longer Than 5 Days
- Doctors with Average OPD Revenue Above ₹5000
- Patients with More Than One Admission in Same Month