Database Engineering: Problem statemtnts for Internal Performance

1. Library Management System

Problem: Design a system to manage books, authors, and issued records.

- **Q1:** Draw an ER diagram for the library system.
- **Q2:** Create tables: Books(BookID, Title, AuthorID, Price), Authors(AuthorID, Name), Issued(BookID, StudentID, IssueDate)
- **Q3:** Insert at least 3 records in each table.
- **Q4:** Write SQL queries:
    1. List all books with price greater than 500.
    2. Display books issued by Student ID = 101.
    3. Count total number of issued books.
    4. Get titles of books issued in both January and February (INTERSECT).
    5. Show book titles along with their corresponding author names.

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2. Hospital Management System

Problem: Manage patients, doctors, and their appointments.

- **Q1:** Draw an ER diagram for hospital system.
- **Q2:** Create tables: Patients(PatientID, Name, Age, Gender), Doctors(DoctorID, Name, Specialization), Appointments(AppointmentID, PatientID, DoctorID, Date)
- **Q3:** Insert sample records.
- **Q4:** Write SQL queries:
    1. List patients older than 60.

2. Display appointments for Doctor ID = 202.
3. Count appointments per doctor.
4. Retrieve appointments in both March and April (INTERSECT).
5. Show patient names with their respective doctor's name.

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3. Online Course Platform

Problem: Track courses, instructors, and enrollments.

- **Q1:** Draw an ER diagram for the course management system.
- **Q2:** Create tables: Courses(CourseID, Title, Duration), Instructors(InstructorID, Name), Enrollments(CourseID, StudentID, EnrollDate)
- **Q3:** Insert sample data.
- **Q4:** Write SQL queries:
    1. List all students enrolled in course ID 'C101'.
    2. Find courses with duration > 3 months.
    3. Count students enrolled per course.
    4. Get students enrolled in both Course A and B (INTERSECT).
    5. Show course titles with instructor names.

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4. Retail Store Inventory

Problem: Manage products, their categories, and sales.

- **Q1:** Draw an ER diagram.

- **Q2:** Create tables: Products(ProductID, Name, CategoryID, Price), Categories(CategoryID, Name), Sales(SaleID, ProductID, Quantity, SaleDate)
- **Q3:** Insert records.
- **Q4:** Write SQL queries:
    1. Find products priced above ₹1000.
    2. Show products sold on '2025-03-01'.
    3. Total quantity sold per product.
    4. Products sold in Store A but not in Store B (EXCEPT).
    5. Product names with their category names.

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5. College Examination System

Problem: Store student marks for subjects and departments.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Students(StudentID, Name, Dept), Subjects(SubjectID, Name), Marks(StudentID, SubjectID, MarksObtained)
- **Q3:** Insert data.
- **Q4:** Write SQL queries:
    1. Students scoring above 75 in any subject.
    2. Subjects where marks are below 35.
    3. Average marks per subject.
    4. Students who appeared in both Sub A and B (INTERSECT).
    5. Student names with subject names and their marks.

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6. Bank Transactions

Problem: Track customers, accounts, and transactions.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Customers(CustomerID, Name, Address), Accounts(AccountID, CustomerID, Balance), Transactions(TransID, AccountID, Amount, TransDate, Type)
- **Q3:** Insert records.
- **Q4:** Write SQL queries:
    1. Customers from 'Pune'.
    2. Transactions for Account ID = 101.
    3. Total amount transacted per account.
    4. Accounts with debit but not credit transactions (EXCEPT).
    5. Customers with their account balances.

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7. Movie Booking System

Problem: Manage movies, theaters, and bookings.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Movies(MovieID, Title, Duration), Theaters(TheaterID, Name, City), Bookings(BookingID, MovieID, TheaterID, ShowDate, TicketsBooked)
- **Q3:** Insert data.
- **Q4:** Write SQL queries:
    1. Movies longer than 2 hours.
    2. Bookings for movie ID 'M101'.

3. Total tickets booked per movie.
4. Movies booked in Theater A or Theater B (UNION).
5. Movie titles with theater names.

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8. Online Shopping Portal

Problem: Manage products, customers, and their orders.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Customers(CustomerID, Name, Email), Products(ProductID, Name, Price), Orders(OrderID, CustomerID, ProductID, OrderDate, Quantity)
- **Q3:** Insert records.
- **Q4:** Write SQL queries:
    1. Customers who ordered after '2025-04-01'.
    2. Products ordered more than 5 times.
    3. Total revenue per product.
    4. Customers who ordered Product A or B (UNION).
    5. Customers with products they ordered.

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9. Vehicle Service Center

Problem: Manage service types and vehicle appointments.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Vehicles(VehicleID, OwnerName, Model), ServiceTypes(ServiceID, Description), Appointments(AppointmentID, VehicleID, ServiceID, ServiceDate)

- **Q3:** Insert data.
- **Q4:** Write SQL queries:
    1. Vehicles of model 'Swift'.
    2. Appointments for Service ID = 501.
    3. Total appointments per service type.
    4. Vehicles that had both Service A and B (INTERSECT).
    5. Vehicle owners with services done.

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10. Hotel Reservation System

Problem: Track room bookings and guest info.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Rooms(RoomID, Type, Price), Guests(GuestID, Name, Phone), Reservations(ReservationID, RoomID, GuestID, CheckInDate, CheckOutDate)
- **Q3:** Insert data.
- **Q4:** Write SQL queries:
    1. Rooms priced above ₹2000.
    2. Reservations made in March.
    3. Total bookings per room.
    4. Guests who stayed in Room A or B (UNION).
    5. Guest names with room types reserved.

11. Gym Management System

Problem: Manage members, trainers, and subscriptions.

- **Q1:** Draw an ER diagram for the gym system.
- **Q2:** Create tables: Members(MemberID, Name, Age), Trainers(TrainerID, Name, Expertise), Subscriptions(MemberID, TrainerID, Type, StartDate)
- **Q3:** Insert at least 3 records per table.
- **Q4:** Write SQL queries:
    1. List all members older than 30.
    2. Find trainers with expertise in 'Cardio'.
    3. Count number of members under each subscription type.
    4. Members subscribed to both 'Basic' and 'Premium' (INTERSECT).
    5. Show member names with their assigned trainer names.

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12. Library Fines System

Problem: Track fines imposed on students for late book returns.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Students(StudentID, Name), Books(BookID, Title), Fines(StudentID, BookID, ReturnDate, FineAmount)
- **Q3:** Add sample records.
- **Q4:** Write SQL queries:
    1. List students who returned books late.
    2. Find fines greater than ₹100.
    3. Display total fine collected per student.
    4. Students fined for both Book A and Book B (INTERSECT).
    5. Show student names with the book titles and fine amounts.

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13. Music Streaming Service

Problem: Manage songs, artists, and user playlists.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Songs(SongID, Title, Duration), Artists(ArtistID, Name), Playlists(UserID, SongID)
- **Q3:** Insert data.
- **Q4:** Write SQL queries:
    1. Songs longer than 5 minutes.
    2. Songs by artist ID = 301.
    3. Count songs added to playlist by each user.
    4. Users who added Song A and Song B to playlist (INTERSECT).
    5. Song titles with their artist names.

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14. School Transport System

Problem: Manage student bus assignments and routes.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Students(StudentID, Name, Class), Routes(RouteID, StartPoint, EndPoint), Assignments(StudentID, RouteID, BusNumber)
- **Q3:** Insert records.
- **Q4:** Write SQL queries:
    1. Students assigned to route ID 'R01'.
    2. Buses driven by 'John'.

3. Count students per route.
4. Students assigned to Route A and Route B (INTERSECT).
5. Show student names with their route details.

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15. Freelance Project Tracker

Problem: Track freelancers, their skills, and assigned projects.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Freelancers(FID, Name, Skill), Projects(PID, Title, Deadline), Assignments(FID, PID)
- **Q3:** Insert relevant data.
- **Q4:** Write SQL queries:
    1. Freelancers with 'Web Development' skill.
    2. Projects with deadlines in April.
    3. Total projects per freelancer.
    4. Freelancers working on both Project A and B (INTERSECT).
    5. Show freelancer names with their assigned projects.

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16. College Event Management

Problem: Track student participation in college events.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Events(EventID, Name, Date), Students(StudentID, Name), Participation(EventID, StudentID)
- **Q3:** Insert sample entries.

- **Q4:** Write SQL queries:
    1. Events scheduled after '2025-04-01'.
    2. Students participating in 'TechFest'.
    3. Number of participants per event.
    4. Students in both Event A and B (INTERSECT).
    5. Show student names with event names.

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17. University Admission Portal

Problem: Manage student applications and department allocation.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Applicants(ApplicantID, Name, Score), Departments(DeptID, Name), Admissions(ApplicantID, DeptID, Status)
- **Q3:** Populate tables.
- **Q4:** Write SQL queries:
    1. Applicants with score above 85.
    2. Applicants admitted to 'Computer Science'.
    3. Average score per department.
    4. Applicants applied to both Dept A and B (INTERSECT).
    5. Show applicant names with department and admission status.

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18. Restaurant Ordering System

Problem: Manage customer orders, items, and billing.

- **Q1:** Draw an ER diagram.

- **Q2:** Create tables: Customers(CID, Name), MenuItems(ItemID, Name, Price), Orders(OrderID, CID, ItemID, OrderDate, Quantity)
- **Q3:** Add records.
- **Q4:** Write SQL queries:
    1. Items priced above ₹300.
    2. Orders placed on '2025-04-01'.
    3. Revenue per menu item.
    4. Customers who ordered both Item A and B (INTERSECT).
    5. Show customer names with ordered item names.

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19. Employee Leave Management

Problem: Manage employee leaves and departments.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Employees(EID, Name, Dept), LeaveApplications(EID, LeaveDate, Reason)
- **Q3:** Insert records.
- **Q4:** Write SQL queries:
    1. Employees from 'HR'.
    2. Leave applications in March.
    3. Leaves taken per employee.
    4. Employees on leave in both Jan and Feb (INTERSECT).
    5. Show employee names with their leave details.

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20. NGO Donation Tracking

Problem: Manage donors, donations, and beneficiaries.

- **Q1:** Draw an ER diagram.
- **Q2:** Create tables: Donors(DonorID, Name, Email), Beneficiaries(BeneficiaryID, Name, Cause), Donations(DonationID, DonorID, BeneficiaryID, Amount, Date)
- **Q3:** Insert sample data.
- **Q4:** Write SQL queries:
    1. Donors who donated more than ₹5000.
    2. Donations made after '2025-04-01'.
    3. Total donations received per beneficiary.
    4. Donors who supported both Beneficiary A and B (INTERSECT).
    5. Show donor names with donated amount and beneficiary details.