Database Systems Lab (CL2005)
Date: October 7th 2025
Course Instructor(s):
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Lab Mid Exam (A)
Total Time: 1 Hour 30 Min
Total Marks: 50 (25 wtg)
Total Questions: 03
Semester: Fall-2025
Campus: Karachi
Dep[redacted]omputer Science

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Student Name Roll No Section Student Signature

CLO 3: Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.

Q1. You are working as a **Database Developer** in a company that uses Oracle HR schema. The HR manager has asked you to prepare reports using **joins** and **subqueries**. Solve the following: [= 10wtg 20 marks]

1. List the **employee names, job titles, department names, and city** of all employees.
2. Find the employees who earn **more than the average salary of their department.** Display **employee_id, name, salary, department_id.**
3. Find the names of employees who work in the **same department** as **'Steven King'**, but exclude Steven King himself. Display **employee_id, name, department_name.**
4. Display the **highest paid employee in each department**, showing **department_name, employee_name, salary.**
5. Find the **location (city)** that has the maximum number of employees, using the employees, departments, and locations tables.
6. Display the department name, manager name, and the number of employees working under each manager.
7. Find employees who were hired before their department's manager. Display employee name, hire date, and manager name.
8. Show the job title and average salary for each job where the average salary exceeds **$10,000.**
9. List all departments that do not have any employees assigned. Display department_id and department_name.
10. Find employees who earn the **maximum commission percentage** in the company. Display employee name, salary, and commission_pct.

CLO 4: Transform an information model into a relational database schema and to use a data definition language and/or utility to implement the schema using a DBMS.

Q2. You are tasked with designing an **E-Commerce Management System** database. The system must manage **Customers, Products, Orders, and OrderItems**. The database should enforce constraints to ensure data integrity and reflect real-world rules. [=7.5v/tg 15 marks]

1) Each customer has a unique customer ID.
2) Each product has a unique product code.
3) The orders table stores which product(s) are ordered by which customer.
4) Deleting a customer should not automatically delete their orders, but the system should prevent deletion if the customer has active (pending) orders.
5) Updating the product code should propagate automatically to the order items table.

Q1: Create Table – Customers
Write a DDL statement to create a customer's table with the following:

a) customer_id (should not be accept any null or duplicate values)
b) first_name (required)
c) last_name (required)
d) email (remove duplication, must be having the value)
e) phone (should be unique)

Q2: Create Table – Products
Write a DDL statement to create a Products table with the following:

a) product_id (should not be accept any null or duplicate values)
b) product_name (required)
c) price (**must be greater then 0**)
d) stock_quantity (should be non negative value)

Q3: Create Table – Orders
Write a DDL statement to create an Orders table with the following:

a) order_id (should not be accept any null or duplicate values)
b) customer_id
c) order_date (required)
d) status (must be `'Pending'`, `'Shipped'`, `'Delivered'`, `'Cancelled'`)

Q4: Create Table – OrderItems
Write a DDL statement to create an OrderItems table with the following:

a) order_item_id (should not be accept any null or duplicate values)
b) order_id,
c) product_id,
d) quantity (must be greater than or equal to 1)
e) subtotal (**calculated as price × quantity**)

After Creating Tables, Perform the following queries:

a) Insert a new customer named Ali Raza with a unique email and phone number.
b) Insert a new product "Laptop" priced at 100,000 with a stock of 10.
c) Record a new order for Ali Raza with status 'Pending'.
d) Add an order item for that order with 2 Laptops.
e) Update the stock of "Laptop" to reflect the purchase.
f) Update the order status to 'Shipped'.
g) Retrieve all customers who purchased products worth more than 50,000.
h) Find the most frequently ordered product.

CLO 4: Transform an information model into a relational database schema and to use a data definition language and/or utility to implement the schema using a DBMS.

Q3. You are a Database Designer for a **Vehicle Rental Management System**. The company wants to manage **customers, vehicles, rentals, and payments**. [=7.5 wtg 15 marks]

The business requirements are as follows:

a) Each customer has a unique customer ID, first name, last name, and driver's license number.
b) Each vehicle has a unique vehicle ID, model, type (car, bike, van), and rental rate per day.
c) A rental records which customer rented which vehicle, rental start date, and return date.
d) Payments are linked to rentals. A rental can have one or more payments.
e) A vehicle can be rented multiple times, but only by one customer at a time.
f) Customers can rent multiple vehicles over time.

Q1: Logical Data Model

a) Draw an ERD (Entity-Relationship Diagram) for the vehicle rental system.
b) Include entities, attributes, primary keys, and relationships.
c) Indicate cardinality (one-to-many, many-to-many) for each relationship.

Q2: Relational Data Model

a) Convert the ERD into a relational schema.
b) Identify tables, primary keys, foreign keys, and constraints.
c) Show how to enforce rules such as preventing a vehicle from being rented by two customers at the same time.

<----------Best Of Luck---------->