Ambo University
Woliso Campus
Computer Science Department

Fundamentals of Database Systems
Assignment

Assignment Title: Database Design and Implementation

QUESTION 1

Scenario

Student Information Management System (SIMS)

Ambo University wants to develop a **Student Information Management System (SIMS)** to store and manage student records efficiently. The system should keep track of students' personal details, academic records, courses they enroll in, and the instructors who teach them.

Each student has a unique Student ID, name, date of birth, contact details, and address. Students enroll in multiple courses, and each course is taught by an instructor. Every instructor has an Instructor ID, name, and department. Courses have a unique Course Code, title, credit hours, and prerequisites.

The university wants a database that ensures data integrity, avoids data redundancy, and allows easy retrieval of information.

Step 1: Identifying Entities and Attributes

1. Identify the main entities for the university's **SIMS** database.

2. List at least five attributes for each entity, clearly specifying primary keys.

3. Determine relationships between these entities (e.g., one-to-many, many-to-many).

Step 2: Entity-Relationship (ER) Diagram

4. Draw an ER Diagram representing the relationships between the identified entities.

5. Use **Crow's Foot Notation** or **Chen Notation** to clearly represent relationships.

Step 3: Converting ER Model to Relational Schema

6. Convert the ER model into a relational schema by defining tables and attributes.

7. Specify primary keys and foreign keys for each table.

Step 4: Normalization

8. Analyze your schema for data redundancy and update anomalies.

9. Apply Normalization (at least up to Third Normal Form - 3NF) and describe the process.

Step 5: SQL Implementation

10. Write SQL CREATE TABLE statements for all tables in your schema.

11. Insert sample data into the tables using SQL INSERT statements.

12. Write SQL queries to:

- Retrieve all students enrolled in a specific course.
- Get the total number of students per department.
- List instructors and the courses they teach.

Step 6: Integrity Constraints

13. Define and implement constraints such as NOT NULL, UNIQUE, CHECK, and FOREIGN KEY.

Submission Requirements

- ER Diagram (Hand-drawn or using software like Draw.io or Lucidchart).
- SQL scripts for table creation, data insertion, and queries.
- Brief report explaining design decisions and normalization steps.

QUESTION 2

Scenario

Library Management System

You are tasked with designing and implementing a database system for a "Library Management System. The library needs to manage information about books, authors, publishers, members, and borrowing transactions. The system should allow librarians to track which books are available, which books are borrowed, and when they are due for return.

QUESTION 3

Scenario

E-Commerce Order Management System

In an E-Commerce Order Management System, customers place orders for products, which are shipped by various suppliers. The system needs to track customer information, products, orders, suppliers, and payments. Each order can contain multiple products, and the order may be paid using different payment methods. Additionally, the system manages returns, reviews, and inventory levels of each product.

QUESTION 4

Scenario

Hospital Management System

A Hospital Management System needs to manage patients, doctors, nurses, medical records, appointments, and treatments. Each patient can have multiple appointments with various doctors, and doctors specialize in different medical fields. The system needs to record the treatment history of each patient, the medications prescribed, and the procedures performed. Additionally, the hospital wants to track staff (doctors and nurses) working schedules.

The steps followed on question 1 must be applied to the rest of questions(2, 3 & 4).