UNIT ONE — DATA MODELING (Conceptual Data Model) EXERCISES

Exercise 1: Identify Entities and Attributes

Read the scenario below and answer the questions.

Scenario:
A college manages trainees, trainers, departments, and competencies. Trainees enroll in different competencies, and each trainer teaches multiple competencies.

Tasks:

1. Identify **five entities** in the scenario.
2. List at least **four attributes** for each entity.
3. Identify **primary keys** for each entity.
4. Identify **three relationships** among the entities.

Exercise 2: Determine Relationship Types

Using the entities from Exercise 1:

1. Determine whether each relationship is:
    - One-to-One
    - One-to-Many
    - Many-to-Many
2. Explain **why** each relationship fits that type.

Exercise 3: Draft a Conceptual ER Diagram

Using the entities and relationships from the scenario:

1. Draw a **simple ERD** using crow's foot notation.
2. Include:
    - Entities
    - Primary keys
    - Attributes
    - Relationship connectors
    - Cardinality symbols

Exercise 4: Review Business Rules

Write at least **six** business rules from this scenario:

Scenario:
A library issues books to members. A member can borrow up to **three books** at a time. A book can only be borrowed by one member at a time.

Exercise 5: Document an ERD

Based on the library scenario:

1. Draw the ER diagram.
2. Write a **one-page ERD documentation**, explaining:
    - The purpose of the system
    - List of entities and attributes
    - Relationship definitions
    - Business rules
    - Assumptions

UNIT TWO — NORMALIZATION EXERCISES

Exercise 6: Identify Functional Dependencies

Given the table:

StudentID StudentName CourseID CourseName TrainerID TrainerName

Tasks:

1. Identify **all functional dependencies**.
2. Identify partial and transitive dependencies.
3. Determine whether the table is in **1NF, 2NF, or 3NF**.

Exercise 7: Normalize to 1NF, 2NF, 3NF

Normalize the table from Exercise 6 into:

- 1NF
- 2NF
- 3NF

Show each step clearly:

1. Remove repeating groups
2. Remove partial dependencies
3. Remove transitive dependencies

Final output:

- **Three normalized tables**
- Primary keys for each
- Foreign keys
- ERD of normalized structure

Exercise 8: Compare Normalized Data With ERD

Using the results of Exercise 7:

1. Compare your final tables with the conceptual ERD from Unit One.
2. List any **differences**:
    - Missing entities
    - Merged entities
    - Split entities
    - Extra attributes
3. Explain **why** normalization changed the structure.

Exercise 9: Reconcile Differences

Fix the differences found in Exercise 8:

1. Redraw the ERD to match the normalized tables.
2. Document the final structure.

UNIT THREE — DATA MODEL VALIDATION EXERCISES

Exercise 10: Interview Stakeholder and Validate Model

Imagine you are interviewing a system user (e.g., a registrar).

Tasks:

1. Write **five questions** to validate the ERD.
2. Document **three corrections** based on user feedback.

Exercise 11: Update ERD after Client Feedback

Based on feedback:

1. Modify at least **three entities**.
2. Add, remove, or update **relationships**.
3. Redraw the ER diagram.

Exercise 12: Write Final ERD Documentation

Prepare a professional document including:

1. System purpose
2. Entities and attributes
3. Relationship descriptions
4. Business rules
5. Assumptions
6. Client approval signature area