

CPE241 Module 1: Ultimate Cheat Sheet (Mock Exam Reference)

Generated for Exam Prep

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Part 1: Core Concepts (Expanded & Related)

1. Database Pioneers & Models

- **Dr. Edgar F. Codd (E.F. Codd):** The "Father" of the Relational Model (1970). Proposed the 12 rules for RDBMS.
- **Peter Chen:** The creator of the Entity-Relationship (ER) Model (1976).
- **Charles Bachman:** Developer of the Network Model (IDS). Known for Bachman diagrams.

2. Characteristics of Relations (Tables)

- **Rows (Tuples):**
 - **Uniqueness:** No duplicate rows allowed (Key concept).
 - **Order:** Row order is **insignificant**.
- **Columns (Attributes):**
 - **Atomic:** Cells must have single values (1NF).
 - **Homogenous:** All values in a column must be same type.
 - **Order:** Column order is **insignificant**.

3. Attribute Classifications & Notation

- **Simple:** Atomic, cannot be split (e.g., Blood Type). *Solid Ellipse*.
- **Composite:** Can be split into sub-attributes (e.g., Name → First, Last).
- **Multi-valued:** Has multiple values for one entity. *Double Ellipse*. (Requires new table).
- **Derived:** Calculated from others (e.g., Age from Birthdate). *Dashed Ellipse*.
- **Stored:** Attributes physically saved in the DB.

4. Keys & Identification

- **Super Key:** Any set of attributes that uniquely identifies a row.
- **Candidate Key:** A **minimal** Super Key.
- **Primary Key (PK):** The chosen candidate key. Not NULL.
- **Foreign Key (FK):** Links to a PK in another table.

5. ER Notation & Weak Entities (Chen Model)

- **Strong Entity:** Rectangle. Independent existence.
- **Weak Entity:** Double Rectangle. Dependent existence.
 - *Identification:* Identified by its **Partial Key** + Owner's PK.
- **Identifying Relationship:** Double Diamond. Connects Weak to Owner.
- **Total Participation:** Double Line. Entity *must* participate (min=1).

6. Mapping Relationships

- **1:1:** Collapse into 1 table if Total Participation on both sides. Else add FK to Total side.
- **1:N:** FK goes to "Many" side.
- **M:N:** Create a **New Junction Table**. Composite PK (FK_A + FK_B).

7. Integrity Constraints

- **Entity Integrity:** PK cannot be NULL + Must be Unique.
- **Referential Integrity:** FK must match Parent PK or be NULL.
- **Domain Constraint:** Values must match defined type.

8. EER Constraints

- **Disjoint (d):** Entity must be **only one** subclass.
- **Overlapping (o):** Entity can be **multiple** subclasses.

9. SQL Categories

- **DDL:** CREATE, ALTER, DROP, TRUNCATE.
- **DML:** INSERT, UPDATE, DELETE, SELECT.
- **DCL:** GRANT, REVOKE.

10. Modification Rules

- **DELETE requires WHERE:** Without WHERE, it deletes all rows.
 - **UPDATE requires WHERE:** Without WHERE, it updates all rows.
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Part 2: Short Answer Concepts

- **Schema Modification (ALTER):**
 - ALTER TABLE t ADD column type;
 - ALTER TABLE t MODIFY column type;
 - ALTER TABLE t DROP COLUMN column;
 - ALTER TABLE t RENAME TO new_name;
 - **Deletion Commands:**
 - **DELETE:** SQL DML. Slow.
 - **TRUNCATE:** SQL DDL. Fast (Resets ID).
 - **DROP:** SQL DDL. Removes Table completely.
 - **Weak Relationship:** A relationship where the child cannot exist without the parent (e.g., Hotel - Room).
 - **Composite Key:** PK made of 2+ attributes. Essential for M:N junction tables.
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Part 3: Simulation Practice (Long Answer Style)

Practice Problem 1: SQL Design (Table Recreation)

Problem: Write SQL to create table and insert 2 rows.

member_id	username	email	points
1001	gamer_x	x@game.com	500
1002	pro_player	pro@gam.com	NULL

Answer:

```
1 CREATE TABLE Members (
2     member_id INT PRIMARY KEY,
3     username VARCHAR(50) NOT NULL,
4     email VARCHAR(100) NOT NULL,
5     points INT
6 );
7
8 INSERT INTO Members VALUES (1001, 'gamer_x', 'x@game.com', 500);
9 INSERT INTO Members VALUES (1002, 'pro_player', 'pro@gam.com', NULL);
```

Practice Problem 2: ER Conceptual Design

Problem Scenario: Design an ER Diagram for Company Project System.

- A Department controls many Projects (1:N).
- Each Project has multiple Tasks (Weak Entity).

Diagram Solution:

