DBMS Smart Notes (Unit-wise Quick Revision)

For testing: headings, bullets, tables, code blocks, and multi-page layout.

Unit 1: Introduction to DBMS

- Database: organized collection of related data.
- DBMS: software to create, store, retrieve, and manage databases.
- Advantages: reduced redundancy, better consistency, security, concurrency control, backup & recovery.
- Data independence: ability to change schema at one level without changing the next level.

Three-Schema Architecture

- External level: user views (multiple).
- Conceptual level: community view (logical schema).
- Internal level: physical storage details.

Unit 2: ER Model

Key terms: Entity, Attribute, Relationship, Cardinality, Participation.

Concept	Meaning	Example
Entity	Real-world object	Student, Course
Attribute	Property of entity	Student.name, Course.code
Relationship	Association between entities	Enrolls(Student, Course)
Cardinality	Mapping constraint	1:1, 1:N, M:N

Unit 3: Relational Model + Relational Algebra

Relation = table, Tuple = row, Attribute = column, Domain = set of allowed values.

- Selection: σ(condition)(R)
- Projection: π(attributes)(R)
- Union: R ∪ S
- Set difference: R − S
- Cartesian product: R × S
- Join: R ■ S (theta/natural join)

Unit 4: SQL Basics

```
-- DDL
CREATE TABLE Student(
  sid INT PRIMARY KEY,
  name VARCHAR(50),
  dept VARCHAR(10),
  cgpa DECIMAL(3,2)
);

-- DML
SELECT dept, AVG(cgpa) AS avg_cgpa
FROM Student
GROUP BY dept
HAVING AVG(cgpa) >= 7.5;
```

Unit 5: Normalization (Quick)

- 1NF: atomic values (no repeating groups).
- 2NF: 1NF + no partial dependency on a candidate key.
- 3NF: 2NF + no transitive dependency on a key.
- BCNF: for every FD $X \rightarrow Y$, X must be a super key.

Unit 6: Transactions & Concurrency

ACID properties: Atomicity, Consistency, Isolation, Durability.

- Serial schedule: transactions execute one after another.
- Serializable schedule: equivalent to some serial schedule.
- Locks: Shared (S) for read, Exclusive (X) for write.
- Deadlock: cycle in wait-for graph.

Practice Questions

- Differentiate between DBMS and RDBMS with examples.
- Draw ER diagram for Library Management System.
- Convert ER to relational schema (mention keys).
- Given FDs, find candidate keys and normalize to 3NF/BCNF.
- Write SQL queries using JOIN + GROUP BY + HAVING.
- Explain 2PL and how it ensures conflict serializability.