

What are ACID Properties in DBMS?

✓ Definition:

ACID properties are a set of **four key rules** that ensure **reliable and consistent transactions** in a database. They are essential to maintain **data integrity**, especially when multiple users or systems access the database.

ACID stands for:

- **A** – Atomicity
- **C** – Consistency
- **I** – Isolation
- **D** – Durability

✓ ACID Properties Explained:

1. ✎ Atomicity – “All or nothing”

- A transaction should either **complete fully** or **not happen at all**.
- If any part of the transaction fails, the entire transaction is **rolled back** (undone).

✓ Example:

If you're transferring ₹100 from Account A to Account B:

- Debit ₹100 from A ✓
 - Credit ₹100 to B ✗ (fails)
- Whole transaction is cancelled (₹100 remains in A)

2. ✓ Consistency – “Data must always be valid”

- The database must move from **one valid state to another**.
- Rules like **foreign keys, constraints, triggers** must always be satisfied.

✓ Example:

A bank account balance can't be negative if rules say so.

If a transaction causes a negative balance → it's rejected.

3. 🔒 Isolation – “No interference between transactions”

- Each transaction runs **as if it's the only one** in the system.
- It prevents **dirty reads, lost updates**, etc.

✓ Example:

Two people trying to buy the **last ticket** at the same time:

→ Isolation ensures only one transaction completes.

4. 📁 Durability – “Once done, always saved”

- After a transaction is committed, **changes are permanent** — even in case of power failure or crash.

✓ Example:

You transfer money via UPI and get a confirmation ✓

→ Even if your app crashes, money is not lost.

✓ Summary Table (Copy-Paste Ready):

| Property | Meaning |
|-------------|---|
| Atomicity | All steps of a transaction succeed or none |
| Consistency | Data remains valid before and after the transaction |
| Isolation | Transactions do not affect each other |
| Durability | Once committed, data stays saved permanently |

Let me know if you want **a diagram, real-world analogy**, or the **ACID vs BASE** comparison next!