

# ACID vs BASE

## ◆ ACID কী?

👉 Traditional Relational Database (MySQL, PostgreSQL, Oracle) follow করে

**ACID = ৪টা strong guarantee**

A → Atomicity

C → Consistency

I → Isolation

D → Durability

**1. Atomicity – সব হবে, না হলে কিছুই না**

**মানে:**

একটা transaction-এর সব operation একসাথে সফল হবে

একটা fail হলে → সব rollback ✗

**Example:**

A account → 500 taka

B account → 200 taka

Transfer 300 taka from A to B

- A থেকে 300 কাটা হলো ✗
- B তে 300 ঘোগ হলো ✗ (crash)

👉 Rollback → A = 500, B = 200

## 2. Consistency – DB rules কখনো ভাঙবে না

মানে:

- Primary key
- Foreign key
- Balance never negative

সব constraint **always valid**

👉 Transaction শেষে DB **valid state** এ থাকবে

## 3. Isolation – concurrent transaction একে অপরকে disturb করবে না

Example:

দুইজন একই সময় withdraw করছে

Isolation level অনুযায়ী:

- Read Uncommitted ✗
- Read Committed
- Repeatable Read
- Serializable ✓ (strongest)

👉 User বুঝতেই পারবে না parallel কাজ চলছে

## 4. Durability – commit হলে শেষ কথা

মানে:

Transaction commit হলে

👉 Power off হলেও data থাকবে

- Disk write
- WAL (Write Ahead Log)
- Replication

## ◆ BASE কী?

👉 NoSQL / Distributed Database follow করে

B → Basically Available

A → Soft state

E → Eventual consistency

### 1. Basically Available

- System সবসময় response দেবে
- Network fail হলেও

👉 Availability > Consistency

### 2. Soft State

- Data temporary inconsistent হতে পারে
- Cache / replica different হতে পারে

👉 State change হতে পারে even without user input

### 3. Eventual Consistency

👉 কিছু সময় পরে

👉 সব node এ same data হয়ে যাবে

#### Example:

Instagram Like count:

Node 1 → 101 likes

Node 2 → 98 likes

কিছু সময় পরে:

Node 1 → 101

Node 2 → 101 

### 🔥 ACID vs BASE (Side-by-Side)

Topic	ACID	BASE
Consistency	Strong	Eventual
Availability	Lower	High
Scalability	Hard	Easy
Performance	Slower	Faster
Transactions	Strict	Relaxed
Use case	Banking	Social media
DB Type	SQL	NoSQL

## CAP theorem relation

System	CAP Choice	Model
SQL DB	CA	ACID
MongoDB	CP	ACID + tweaks
Cassandra	AP	BASE
DynamoDB	AP	BASE

## Real-world Example

### Bank Transfer

Wrong balance 

Slow but correct 

### ACID

### Facebook Likes

Fast response 

Exact count later 

### BASE

## Interview Killer Lines

“ACID prioritizes data correctness, while BASE prioritizes availability and scalability.”

“In large-scale distributed systems, BASE is often preferred due to CAP theorem constraints.”

### মনে রাখার Trick

Money → ACID

Social → BASE

Correctness → ACID

Scale → BASE