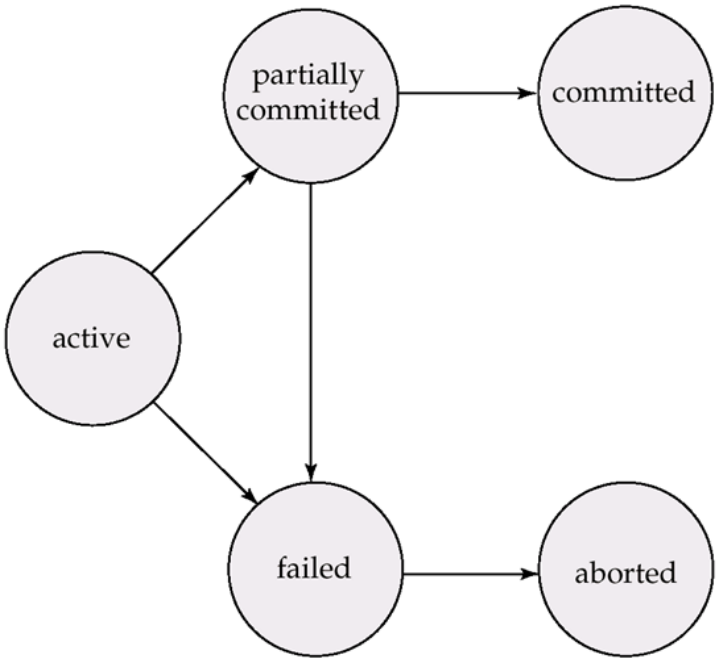
Transaction

What is Transaction?

A transaction is a unit of program execution that accesses and possibly updates one or more data items in the database.
A group of tasks where the task is a minimum processing unit which cannot be divided further.

State of Transaction

Active: The initial state, the transaction stays in this state while it is executing.
Partially committed: After the final statement has been executed.
Failed: After the discovery that normal execution can no longer proceed.
Aborted: After the transaction has been rolled back and the database has been restored to its state prior to the start of the transaction.
Committed: After successful completion.



ACID Properties

Atomicity:
Atomicity means that transactions execute as a whole.
DBMS to guarantee that either all of the operations are performed or none of them.

Example: transfer of funds between banks: either withdraw+deposit both execute successfully or none of them, In case of failure Database remains unchanged.

Consistency:
Consistency means the database is in legal state when the transaction begins and when it ends.
Only valid data will be written in the database and transactions cannot break the rules of database e.g Integrity Constraints: Primary keys, foreign key.

Example of this is that Transaction cannot end with a duplicate primary key in the table.

Isolation:
Multiple transactions running at the same time do not impact each other's execution.
Transactions don't see other transaction's uncommitted changes.

Isolation level defines how deep transactions isolate from one another.

Isolation's example: if two or more people try to buy the last copy of a product, just one of them will succeed.

DURABILITY
Durability means if a transaction is committed it becomes persistent, cannot be lost or undone.
Ensured by use of database transaction logs.

Example of this is that after funds are transmitted and the committed power supply at the DB server is lost, Transactions stay persistent (No data is lost).

Concurrent Transaction

Concurrent execution means running side by side or parallely of transactions.

Advantages of Concurrent execution are:

Improved throughput & Resource utilization:i.e. no. of transactions executed increases in a given amount of time & the processor is utilized properly.

Reduced Waiting time:The unpredictable delays in running transactions as well as the average response time is reduced.