**ACIDIC PROPERTIES IN DBMS –**

**TRANSACTION –**

Atransaction is a single logical unit of work that accesses and possibly modifies the contents of a database. Transactions access data using read and write operations.  
 In order to maintain consistency in a database, before and after the transaction, certain properties are followed. These are called **ACID**properties.

**Properties of Transaction** –

1. Atomicity
2. Consistency
3. Isolation
4. Durability

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1. **ATOMICITY** –

* It states that all operations of the transaction take place at once if not the transaction is aborted.
* There is no midway such as the transaction cannot occur partially. Each transaction is treated as one unit and either run to completion or is not executed at all.

**Atomicity involves the following operation**s -

— **Abort:** If a transaction aborts then all the changes made are

Not visible.

— **Commit:** If a transaction commits, changes made are visible.

**Example** –

Let’s assume that following transaction T consisting of

T1 and T2. A consists of Rs 500 and B consists of Rs 200. Transfer Rs 100

From account X to account Y.

X = 500 Y = 200

T1 T2

Read(X) Read(Y)

X = X – 100 Y = Y - 100

Write(X) Write(Y)

After: X : 400 Before: Y : 300

After completion of the transaction X consists of Rs 400 and Y consists of

Rs 300.

If the transaction T fails after the completion of transaction T1 but before

Completion of transaction T1 but before completion T2, then the amount

Will be deducted from x but not added to Y. This shows the inconsistent

Database state. In order to ensure correctness of database state, the

Transaction must be executed in entirety.

1. **CONSISTENCY** –

This means that integrity constraints must be maintained so that the database is consistent before and after the transaction. It refers to the correctness of a database.

**EXAMPLE –**

The total amount before and after the transaction must be maintained.

Total before T occurs = 500 + 200 = 700.

Total after T occurs = 400 + 300 = 700.

Therefore, the database is consistent.

Inconsistency occurs in case T1 completes but T2 fails. As a result, T is incomplete.

**3. ISOLATION –**

* It shows that the data which is used at the time of execution of a

Transaction cannot be used by the second transaction until the first

One is completed.

In isolation, if the transaction T1 is being

Executed and using the data item x, then that data item can not

be accessed by any other transaction T2 until the transaction T1

ends.

* The concurrency control subsystem of the DBMS enford the isolation properties.

**EXAMPLE –**

Suppose two people try to book the same seat simultaneously.

Transactions are serialized to maintain data consistency.

The first person&#39;s transaction succeeds, and they receive a ticket. The

second person&#39;s transaction fails as the seat is already booked. They receive an error message

indicating no available seats.

**4. DURABILITY -**

* The durability property is used to indicated the performance of the

Database consistent state. It states that the transaction made the permanent changes.

* They can not be lost by the erroneous operation of of a faclty. When a transaction is completed then the consistent state. That consistent state cannot be lost. Even in the event of a systems failure.
* The recovery subsystem of the DBMS has the respsibility of durability property.

**EXAMPLE** :-

Suppose that there is a system failure in the railway management system resulted in the loss

of all booked train details. Millions of users who had paid for their seats are now unable to board the

train, causing significant financial losses and eroding trust in the company. The situation is

particularly critical as these trains are needed for important reasons, causing widespread panic and

inconvenience.

**Uses of ACID Properties :**

In totality, the ACID properties of transactions provide a mechanism

in DBMS to ensure the consistency and correctness of any database.

It ensures consistency in a way that every transaction acts as a group

of operations acting as single units, produces consistent results,

operates in an isolated manner from all the other

produces consistent results, operates in an isolated manner from all

the other operations, and makes durably stored updates. These

ensure the integrity of data in any given database.

**Advantages of ACID properties in DBMS:**

* **Data Integrity**: ACID properties ensure data remains consistent and free from corruption.
* **Reliability**: ACID properties provide consistent and reliable

Execution of transactions.

* **Concurrency Control**: ACID properties enable simultaneous access to data without conflicts.
* **Fault Tolerance**: ACID properties ensure data durability, surviving system failures.
* **Transaction Management**: ACID properties offer structured transaction handling.
* **Compliance and Auditability**: ACID properties facilitate regulatory compliance and

Auditing.

**Disadvantages of ACID properties in DBMS :-**

**Performance Overhead**: ACID properties can impact system

performance and throughput due to additional processing and

resource utilization.

**Complexity**: Implementing ACID properties adds complexity to

database systems, increasing design and maintenance

challenges.

**Scalability Challenges**: ACID properties can pose difficulties in

highly distributed or scalable systems, limiting scalability.

**Potential for Deadlocks**: ACID transactions using locking

mechanisms can lead to deadlocks and system halts.

**Limited Concurrency**: ACID properties may restrict

concurrency, impacting overall system throughput.