Section A

Assignment-4

1. What is hashing?

ans Hashing is a technique that maps data of arbitary size to fixed size values using a hash function often used for quick data retrieval.

2. Difference between Single level index vs Multi level index?

ans • Single level index:

A Single index file for a data file.

• Multi level index:

Index on index files to reduce the size of each index and increases efficiency.

3. What is transaction?

A transaction is a sequence of operations performed as a single logical unit of work in a database, ensuring data integrity.

4. What is serializability?

Serializability is a concept in concurrency control that ensures transaction produce the same result as if they were executed sequentially.

Sec - B

1. What is hashing and explain the hashing techniques?

ans Hashing used hash functions to map keys to locations in a table.

Technique include:

- Division method
- Multiplication method
- mid-Square method
- collision resolution: Chaining, Open Addressing (Linear / Quadratic Probing, Double Hashing)

2. What is transaction ? Explain the ACID Properties and also describe the transaction States with diagram?

ans: A transactions is a set of operations that transforms the database from one consistent state to another.

ACID:

- Atomicity: All operations succeed or fail as one.
- Consistency: Preserves DB consistency.
- Isolation: Transactions execute independently.
- Durability: Results persist after commit.

Transaction State: Active -> Partially committed -> Committed / failed -> Aborted. ~~(Diagrams typically)~~

Sec-C

1. What is deadlock and explain the deadlock handling technique?

ans: A deadlock occurs when transaction wait indefinitely for resources locked by each other.

Handling techniques:

- Deadlock Prevention (resources Ordering, Wait-die, Wound-wait)
- Deadlock detection and recovery.
- Deadlock avoidance (Using Wait-For Graph or Banker's Algorithm)

2. Explain Recovery mechanism from transaction Failure?

ans Recovery ensures database consistency Post-failure Using:

- Log-based recovery (Undo/Redo logs)
- Checkpoints
- Shadow Paging
- Write-Ahead Logging (WAL)

System reverts/rolls forward changes based on log status.