Assignment No. 2

Advanced Database

Unit Title: Transaction Management and Concurrency Control and Recovery

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1. Define a database transaction. Explain the ACID properties with examples. Why are these properties essential for reliable transaction processing?
2. What is a recoverable schedule? Differentiate between recoverable, cascadeless, and strict schedules with examples.
3. Explain the concept of serializability. Compare conflict serializability and view serializability with suitable examples.
4. Describe the Two-Phase Locking protocol. Explain how it ensures serializability and discuss its limitations.
5. Explain how time-stamp ordering is used for concurrency control. Illustrate with an example how read and write operations are handled.
6. What is validation-based concurrency control? Describe the three phases of validation and how conflicts are resolved.
7. Explain the concept of data item granularity. How does multiple granularity locking improve concurrency control?
8. Compare deferred update and immediate update recovery techniques. Discuss their advantages and disadvantages.
9. What is shadow paging? Explain its mechanism and how it differs from traditional log-based recovery methods.

Part B – Case Study & Application

10. Banking Transaction System Design

You are designing a transaction system for a bank that handles thousands of concurrent transactions per minute.

- a) Which concurrency control technique would you implement and why?
- b) How would you ensure recoverability and durability in case of system failure?
- c) Draw a diagram showing the transaction lifecycle with recovery checkpoints.

11. Online Ticket Booking System

An online ticket booking system must prevent double booking and ensure high concurrency.

- a) Which locking strategy would be most effective?
- b) How would you handle deadlocks in this system?
- c) Illustrate with a diagram how transactions are serialized.

12. Real-Time Trading Platform

A stock trading platform requires real-time updates and rollback capabilities.

- a) Compare the use of timestamp ordering vs validation-based concurrency control for this system.
- b) How would shadow paging help in ensuring quick recovery?
- c) Design a flowchart showing transaction execution and recovery steps.