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CSE 3055 – Database Systems Homework IX Report

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1)
a: Backward recovery
b: Switch
c: Forward recovery (using backup copy of database)
d: Reprocessing transactions
e: Forward recovery (from latest checkpoint)

2) Optimistic concurrency is a concurrency conflict approach where rather than having all hands in safety issues, focuses on performance improvement. On contrary, pessimistic concurrency approach allows more security keeping track of them instantly and trying to fix the conflicts happened. Therefore, these tradeoffs if the performance is a must, optimistic concurrency control is advantageous over pessimistic concurrency control.

3) Both of them are using different type of instruction request, such as lock-S instruction for Shared Lock and lock-X instruction for Exclusive Lock. For their capability, exclusive lock can do both read and write operations, but shared lock can only do read operations. For their security capabilities, connecting previous information mentioned, exclusive lock can prevent others from read and write(update), shared lock can prevent others from write(update) on the database.

4) Comparing their functionality, deadlock resolution ensures system to not enter an unsafe state. Deadlock prevention ensures at least one of the necessary conditions that will cause a deadlock will not occur.
Comparing their resources, until at least one safe path found every other path is manipulated for deadlock resolution. On the other hand, for deadlock prevention all the resources are requested at once.
Comparing algorithms used, usage of Banker's algorithm is popular for the deadlock resolution. Mainly non-blocking synchronization algorithms are used for the deadlock prevention.

5)
Recovery manager: Allows restoration for ensuring a reliable and steady state after any failure occurs.
Logging facility: Keeps track of the current state of transactions and any changes occurred.
Backup mechanism: Creates backup copies at a specific interval.
Checkpoint facility: Allows updates for getting the latest patches to be made permanent and keep secure from vulnerability.

6) Transaction Integrity is basically a detection mechanism allowing system to detect illegitimate user's modifications such as insertion, deletion or update.
Considering an environment such as banking where the data obtained from customers is crucially important there is no chance of having a failure in such functionalities. Money may be disappeared without having a record for it, there may be funds transferred to not related accounts etc.

7)
Software Errors: May be caused from resource limit exceeded or factors related to the application software.
Statement Failure: Inability of database to execute the given SQL statement.
Media Failure: An example to this is disk head crash, that can cause whole local data to be demolished.
System Crash: Mainly caused by hardware malfunction. Since it can cause serious impact to the hardware components, it may result with halting in a process or losing some data.

8)
Software failure: This can be caused by maintenance issues of the fundamental software database system is using.
Physical issues: Even though these systems are protected very well, events like having a fire or flooding in the building may cause serious damages.
Human factor: Either by a database administrator or a privileged person misusing the system, there might be some cases where policy violations or non-approved actions done in the database system.
Hacking: Thinking how the banking system is protected in these days banking environment, it is unlikely to have such kind of threat. But still precautions are being made considering these threats.

9)
Atomic: In case of transaction, either all the transaction is done or none of it is done.
Consistent: This property brings consistency to constraints and data transaction policy, ensuring that there will be no violation will be occurred during processes.
Isolated: Provides separation of accessibility between transactions during their execution such that, one transaction has no ability to read any data from another during their execution.
Durable: Transaction effects are permanent. Data storage considered to be for long duration.