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Assignment-8

1. Explain log based recovery technique with example.

→ log-based recovery is a technique where all changes made to the database are recorded in a log file. If a crash occurs the system use the log to redo and undo transaction key components:

- log : records transaction ID, operation old value, new value
- write:- Ahead logging (WAL) : log must be written before actual data is changed

Example:- Assume transaction T_1 updated A from 100 to 150.

Log
<T_1, start>
<T_1, A, 100, 150>
<T_1, commit>

If the system crashes after T_1 commit we redo the change. If it crashes before T_1 commit, we undo it using old value.

2. Explain shadow paging with suitable example and diagram.

→ Shadow paging is a recovery technique where two copies of the database are maintained

3. Write a note a serializibility

→ serializability ensures that the current execution of transaction result in a database state that would be same as if the transaction were executed one after another (serially)

Type:-

conflict serializability:-

Based on reordering non conflicting operations

view serializability :-

Based on final state even if operation are reordered differently

Based on final state even if operations are reordered prevents issues like lost updates and inconsistent analysis

4. Explain the 2 phase locking protocol with respect to DBMS.

→ 2 PL ensures serializability by dividing a transaction in to two phases.

1. Growing phase:-
   - Transaction can aquire locks
   - No locks can be released.
2. shrinking phase:-
   - Transaction can release locks
   - Cannot acquire any new locks

ex -

T_1 :- Read and write data items A

T_2 :- Read and write data items B.

If both follow 2PL, deadlocks and inconsistensis can be avoided.

5. Describe deadlock avoidance using suitable example.

→ Deadlock occurs when two or more transactions wait forever for each other to release locks.

Deadlock avoidance techiques:

- wait-die scheme
  older transactions wait, younger ones are rolled back

- wound-wait:
  older transaction wound (force rollback of) younger ones

Example (cont'd)

- T_1 (timestamp = 10) want a lock held by T_2 (timestamp = 20)
  - T_1 is older → T_1 waits
- T_2 wants a lock held by T_1
  T_2 is younger → T_2 did (roll back)