

Question 1: Optimistic Concurrency Control [150 points]

- (i) [10 points] **Optimistic Concurrency Control:**
Distinguish between: (1) TO and (2) optimistic CC.
- (ii) [10 points] **Optimistic Concurrency Control:**
List the purpose of: (1) read, (2) validate, and (3) write phases.
- (iii) [10 points] **Optimistic Concurrency Control:**
Explain the purpose of a private workspace.
- (iv) [10 points] **Optimistic Concurrency Control:**
List the scenarios in validation.
- (v) [10 points] **Optimistic Concurrency Control:**
Distinguish between: (1) backward validation and (2) forward validation.
- (vi) [10 points] **Optimistic Concurrency Control:**
On what workload does OCC outperform 2PL?
- (vii) [10 points] **Optimistic Concurrency Control:**
On what workload does 2PL outperform OCC?
- (viii) [10 points] **Optimistic Concurrency Control:**
List the limitations of OCC.
- (ix) [10 points] **Phantom Problem:**
Define the phantom problem.
- (x) [10 points] **Phantom Problem:**
Does conflict serializability guarantees serializability if the set of objects is not fixed?
- (xi) [10 points] **Phantom Problem:**
Explain how to avoid the phantom problem.
- (xii) [10 points] **Phantom Problem:**
Explain how to guarantee repeating scans.
- (xiii) [10 points] **Isolation Levels:**
Explain the benefits of weaker levels of isolation.
- (xiv) [10 points] **Isolation Levels:**
Distinguish between: (1) SERIALIZABLE, (2) REPEATABLE READS, (3) READ COMMITTED, and (4) READ UNCOMMITTED.
- (xv) [10 points] **Isolation Levels:**
Explain the benefits of providing hints to the DBMS about whether a txn will modify the database during its lifetime.