

Question 1: ARIES from First Principles [120 points]

- (i) **[10 points] General:**
Distinguish between: (1) Protocol and (2) Algorithm.
- (ii) **[10 points] General:**
Distinguish between: (1) Policy and (2) Mechanism.
- (iii) **[10 points] Shadow paging:**
Explain how data gets fragmented over time with shadow paging. Why is this a problem?
- (iv) **[10 points] WAL:**
Distinguish between WAL and WAL-Deferred Updates.
- (v) **[10 points] Checkpoints:**
Distinguish between: (1) commit-consistent and (2) fuzzy checkpoints.
- (vi) **[10 points] CLR:**
List the purpose of CLRs. During recovery: (1) Should they be redone? (2) Should they be undone?
- (vii) **[10 points] Logical Undo:**
Why is logical undo more concurrent than physical undo?
- (viii) **[10 points] Logical Undo:**
How does logical undo work along with physical redo?
- (ix) **[10 points] Logical Undo:**
Why can't we also do logical redo?
- (x) **[10 points] Selective Redo:**
Why does selective redo not support record-level locking?
- (xi) **[10 points] Selective Redo:**
Why should the DBMS replay history of both committed and uncommitted transactions?
- (xii) **[10 points] General:**
Why do protocols evolve over time?