

**Question 1: Logging (Part 1) ..... [110 points]**

- (i) **[10 points] Logging and Recovery:**  
List the two components of a logging and recovery protocol.
- (ii) **[10 points] Logging and Recovery:**  
What of the ACID properties are guaranteed by the logging and recovery protocol?
- (iii) **[10 points] Logging and Recovery:**  
List the types of storage used by a DBMS.
- (iv) **[10 points] Logging and Recovery:**  
List the types of failures tackled by a DBMS.
- (v) **[10 points] Logging and Recovery:**  
Give examples of: (1) transaction, (2) system, and (3) media failures.
- (vi) **[10 points] Logging and Recovery:**  
Distinguish between: (1) undo and (2) redo actions.
- (vii) **[10 points] Buffer Pool Policies:**  
Distinguish between: (1) STEAL and (2) NO-STEAL policies.
- (viii) **[10 points] Buffer Pool Policies:**  
Distinguish between: (1) FORCE and (2) NO-FORCE policies.
- (ix) **[10 points] Shadow Paging:**  
Explain the policies underlying shadow paging.
- (x) **[10 points] Shadow Paging:**  
Explain the limitations of shadow paging.
- (xi) **[10 points] SQLite:**  
How does SQLite use a journal file?