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| 1. Most real-world database transactions are formed by only one database request.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1 What Is a Transaction? | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 2. Although the DBMS is designed to recover a database to a previous consistent state when an interruption prevents the completion of a required set of transactions, the transactions themselves are defined by the end user or programmer and must be semantically correct.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1a Evaluating Transaction Results | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 3. The DBMS guarantees that the semantic meaning of a transaction truly represents the real-world event.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1a Evaluating Transaction Results | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 4. Atomicity indicates the permanence of the database's consistent state.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 5. Serializability means that data used during the execution of a transaction cannot be used by a second transaction until the first one is completed.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 6. Durability requires that all portions of the transaction must be treated as a single, logical unit of work in which all operations are applied and completed to produce a consistent database.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 7. The multiuser DBMS must implement controls to ensure serializability and isolation of transactions, in addition to atomicity and durability, in order to guard the database's consistency and integrity.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 8. The phenomenon of uncommitted data occurs when two transactions are executed concurrently and the first transaction is rolled back after the second transaction has already accessed the uncommitted data—thus violating the isolation property of transactions.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-2b Uncommitted Data | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 9. The scheduler establishes the order in which the operations within concurrent transactions are executed.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 10. A scheduler facilitates data isolation to ensure that two transactions do not update the same data element at the same time.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 11. A lock guarantees the open use of a data item to multiple transactions.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3 Concurrency Control with Locking | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 12. In a page-level lock, the DBMS will lock an entire diskpage.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 13. A field-level lock allows concurrent transactions to access the same row, as long as they require the use of different fields within that row.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 14. A shared lock produces no conflict as long as all the concurrent transactions are read-write only.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 15. A growing phase in a two-phase lock is when a transaction acquires all the required locks without locking any data.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3c Two-Phase Locking to Ensure Serializability | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 16. Time stamps must only have the single property of uniqueness.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-4 Concurrency Control with Time Stamping | | *LEARNING OBJECTIVES:* | 10.05 - Describe how stamping methods are used for concurrency control | |

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| 17. Time stamping demands a lot of system resources because many transactions might have to be stopped, rescheduled, and restamped.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-4 Concurrency Control with Time Stamping | | *LEARNING OBJECTIVES:* | 10.05 - Describe how stamping methods are used for concurrency control | |

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| 18. An optimistic approach is based on the assumption that the majority of the database operations do not conflict.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-5 Concurrency Control with Optimistic Methods | | *LEARNING OBJECTIVES:* | 10.06 - Describe how optimistic methods are used for concurrency control | |

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| 19. When using an optimistic approach, during the read phase, a transaction reads the database, executes the needed computations, and makes the updates to a private copy of the database values.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-5 Concurrency Control with Optimistic Methods | | *LEARNING OBJECTIVES:* | 10.06 - Describe how optimistic methods are used for concurrency control | |

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| 20. The serializable isolation level is the least restrictive level defined by the ANSI SQL standard.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-6 ANSI Levels of Transaction Isolation | | *LEARNING OBJECTIVES:* | 10.07 - List and explain the ANSI levels of transaction isolation | |

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| Multiple Choice |

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| 21. Transaction is a \_\_\_\_\_ unit of work that must be either entirely completed or aborted.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | time | b. | practical | |  | c. | logical | d. | physical |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1 What Is a Transaction? | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 22. \_\_\_\_\_ requires that all operations of a transaction be completed.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Specificity | b. | Atomicity | |  | c. | Durability | d. | Time stamping |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 23. A consistent database state is one in which all \_\_\_\_\_.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | tables have foreign keys | b. | data integrity constraints are satisfied | |  | c. | table are normalized | d. | SQL statements only update one table at a time |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1 What Is a Transaction? | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 24. \_\_\_\_\_ means that data used during the execution of a transaction cannot be used by a second transaction until the first one is completed.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Serializability | b. | Atomicity | |  | c. | Isolation | d. | Time stamping |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 25. A single-user database system automatically ensures\_\_\_\_\_ of the database, because only one transaction is executed at a time.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | serializability and durability | b. | atomicity and isolation | |  | c. | serializability and isolation | d. | atomicity and serializability |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.02 - Identify the four properties of a database transaction | |

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| 26. ANSI has defined standards that govern SQL database transactions. Transaction support is provided by two SQL statements \_\_\_\_\_ and ROLLBACK.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | RETRIEVE | b. | ASSIGN | |  | c. | UPDATE | d. | COMMIT |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1c Transaction Management with SQL | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 27. Of the following events, which is defined by ANSI as being equivalent to a COMMIT?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Five SQL statements are executed. | b. | The end of a program is successfully reached. | |  | c. | The program is abnormally terminated. | d. | The database is shut down for  maintenance. |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1c Transaction Management with SQL | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 28. Of the following events, which is defined by ANSI as being equivalent to a ROLLBACK?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Five SQL statements are executed. | b. | The end of a program is successfully reached. | |  | c. | All changes are aborted and returned to a previous consistent state. | d. | The database is shut down for maintenance. |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1c Transaction Management with SQL | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 29. The implicit beginning of a transaction is when \_\_\_\_\_.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | a database is started | b. | a table is accessed for the first time | |  | c. | the first SQL statement is encountered | d. | the COMMIT command is issued |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-1c Transaction Management with SQL | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 30. The information stored in the \_\_\_\_\_ is used by the DBMS for a recovery requirement triggered by a ROLLBACK statement, a program's abnormal termination, or a system failure such as a network discrepancy or a disk crash.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | data dictionary | b. | metadata | |  | c. | rollback manager | d. | transaction log |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1d The Transaction Log | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 31. One of the three most common data integrity and consistency problems is \_\_\_\_\_.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | lost updates | b. | disk failures | |  | c. | user errors | d. | deadlocks |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2a Lost Updates | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 32. \_\_\_\_\_ occurs when a transaction accesses data before and after one or more other transactions finish working with such data.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Inconsistent retrieval | b. | The phenomena of uncommitted data | |  | c. | Lost update problems | d. | Dirty read problems |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-2c Inconsistent Retrievals | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 33. As long as two transactions, T1 and T2, access \_\_\_\_\_ data, there is no conflict, and the order of execution is irrelevant to the final outcome.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | shared | b. | common | |  | c. | unrelated | d. | locked |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 34. \_\_\_\_\_ are required to prevent another transaction form reading inconsistent data.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Locks | b. | Schedules | |  | c. | Stamps | d. | Logs |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3 Concurrency Control with Locking | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 35. The \_\_\_\_\_ manager is responsible for assigning and policing the locks used by transactions.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | transaction | b. | database | |  | c. | lock | d. | schedule |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3 Concurrency Control with Locking | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 36. Lock \_\_\_\_\_ indicates the level of lock use.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | granularity | b. | shrinking | |  | c. | growing | d. | serializability |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 37. A \_\_\_\_\_ lock will lock the entire table, preventing access to any row by a transaction while another transaction is using the table.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | database-level | b. | table-level | |  | c. | page-level | d. | row-level |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 38. A \_\_\_\_\_ lock will lock the entire diskpage.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | transaction-level | b. | table-level | |  | c. | page-level | d. | row-level |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 39. A diskpage, or page, is the equivalent of a \_\_\_\_\_.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | database table | b. | disk sector | |  | c. | database schema | d. | diskblock |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 40. A \_\_\_\_\_ lock allows concurrent transactions to access different rows of the same table.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | database table | b. | table-level | |  | c. | page-level | d. | row-level |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 41. A(n) \_\_\_\_\_ specifically reserves access to the transaction that locked the object.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | shared lock | b. | exclusive lock | |  | c. | binary lock | d. | deadlock |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 42. A(n) \_\_\_\_\_ lock exists when concurrent transactions are granted read access on the basis of a common lock.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | shared | b. | exclusive | |  | c. | binary | d. | two-phase |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 43. What rule applies to the two-phase locking protocol?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | Two transactions cannot have conflicting lock. | b. | No unlock operation can precede a lock operation in a different transaction. | |  | c. | No data is affected until all locks are released. | d. | No data is affected until the transaction is in its locked position. |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3c Two-Phase Locking to Ensure Serializability | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 44. A(n) \_\_\_\_\_ phase in a two phase lock is when a transaction releases all locks and cannot obtain a new lock.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | growing | b. | shrinking | |  | c. | locking | d. | unlocking |  |  |  | | --- | --- | | *ANSWER:* | b | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3c Two-Phase Locking to Ensure Serializability | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 45. A(n) \_\_\_\_\_ condition occurs when two or more transactions wait for each other to unlock data.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | deadlock | b. | exclusive lock | |  | c. | binary lock | d. | two-phase lock |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3d Deadlocks | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 46. The \_\_\_\_\_ approach to scheduling concurrent transactions assigns a global unique stamp to each transaction.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | scheduled | b. | table-locking | |  | c. | unique | d. | time stamping |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-4 Concurrency Control with Time Stamping | | *LEARNING OBJECTIVES:* | 10.05 - Describe how stamping methods are used for concurrency control | |

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| 47. In the wait/die scheme, the:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | older transaction rolls back the younger transaction and reschedules it. | b. | younger, preempted transaction is rescheduled using the same time stamp. | |  | c. | older transaction waits for the younger one to complete and release its locks. | d. | younger and older transactions both wait indefinitely to be released. |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-4a Wait/Die and Wound/Wait Schemes | | *LEARNING OBJECTIVES:* | 10.05 - Describe how stamping methods are used for concurrency control | |

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| 48. In the optimistic approach, during the\_\_\_\_\_ phase, a transaction scans the database, executes the needed computations, and makes the updates to a private copy of the database values.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | read | b. | validation | |  | c. | write | d. | shared |  |  |  | | --- | --- | | *ANSWER:* | a | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-5 Concurrency Control with Optimistic Methods | | *LEARNING OBJECTIVES:* | 10.06 - Describe how optimistic methods are used for concurrency control | |

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| 49. In the optimistic approach, during the \_\_\_\_\_ phase, changes are permanently applied to the database.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | read | b. | validation | |  | c. | write | d. | shared |  |  |  | | --- | --- | | *ANSWER:* | c | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-5 Concurrency Control with Optimistic Methods | | *LEARNING OBJECTIVES:* | 10.06 - Describe how optimistic methods are used for concurrency control | |

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| 50. The \_\_\_\_\_ isolation level ensures that queries return consistent results.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | a. | read uncommitted | b. | read committed | |  | c. | serializable | d. | repeatable read |  |  |  | | --- | --- | | *ANSWER:* | d | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-6 ANSI Levels of Transaction Isolation | | *LEARNING OBJECTIVES:* | 10.07 - List and explain the ANSI levels of transaction isolation | |

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| 51. Although the DBMS is designed to recover a database to a previous consistent state when an interruption prevents the completion of a required set of transactions, the transactions themselves are defined by the end user or programmer and must be \_\_\_\_\_ correct.   |  |  | | --- | --- | | *ANSWER:* | semantically | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1a Evaluating Transaction Results | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 52. If a(n) \_\_\_\_\_ is issued before the termination of a transaction, the DBMS will restore the database only for that particular transaction, rather than for all transactions, in order to maintain the durability of the previous transactions.   |  |  | | --- | --- | | *ANSWER:* | ROLLBACK | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1d The Transaction Log | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 53. The objective of \_\_\_\_\_ control is to ensure the serializability of transactions in a multiuser database environment.   |  |  | | --- | --- | | *ANSWER:* | concurrency | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2 Concurrency Control | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 54. The \_\_\_\_\_ occurs when two concurrent transactions, T1 and T2, are updating the same data element and one of the updates is lost.   |  |  | | --- | --- | | *ANSWER:* | lost update problem | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2a Lost Updates | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 55. The scheduler’s main job is to create a(n) \_\_\_\_\_ of a transaction’s operation, in which the interleaved executions of transactions yield the same results as if the transactions were executed in serial order.   |  |  | | --- | --- | | *ANSWER:* | serializable schedule | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 56. The \_\_\_\_\_ interleaves the execution of database operations to ensure serializability.   |  |  | | --- | --- | | *ANSWER:* | scheduler | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 57. To determine the appropriate order of the operations, the scheduler bases its actions on concurrency control algorithms, such as \_\_\_\_\_ or time stamping methods.   |  |  | | --- | --- | | *ANSWER:* | locking | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-2d The Scheduler | | *LEARNING OBJECTIVES:* | 10.03 - Explain concurrency control and its role in maintaining database integrity | |

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| 58. Most multiuser \_\_\_\_\_ automatically initiate and enforce locking procedures, where all locking information is managed by the lock manager.   |  |  | | --- | --- | | *ANSWER:* | DBMSs  database management systems  database management systems (DBMSs) | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3 Concurrency Control with Locking Methods | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 59. \_\_\_\_\_ can take place at any of the following levels: database, table, page, row, or field.   |  |  | | --- | --- | | *ANSWER:* | Locking | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 60. \_\_\_\_\_-level locks are less restrictive than database-level locks, but they create traffic jams when many transactions are waiting to access the same table.   |  |  | | --- | --- | | *ANSWER:* | Table | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3a Lock Granularity | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 61. As a rule, a(n) \_\_\_\_\_ must unlock the object after its termination.   |  |  | | --- | --- | | *ANSWER:* | transaction | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 62. The \_\_\_\_\_ rule states that only one transaction at a time can own an exclusive lock on the same object.   |  |  | | --- | --- | | *ANSWER:* | mutual exclusive | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 63. If T1 has not unlocked data item Y, T2 cannot begin; if T2 has not unlocked data item X, T1 cannot continue. Consequently, T1 and T2 each wait for the other to unlock the required data item. Such a deadlock is also known as a(n) \_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | deadly embrace | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3d Deadlocks | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 64. Uniqueness ensures that no equal time stamp values can exist, and \_\_\_\_\_ ensures that time stamp values always increase.   |  |  | | --- | --- | | *ANSWER:* | monotonicity | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-4 Concurrency Control with Time Stamping Methods | | *LEARNING OBJECTIVES:* | 10.05 - Describe how stamping methods are used for concurrency control | |

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| 65. In a heavily used database management system (DBMS), the prevention and detection of \_\_\_\_\_ constitutes an important DBMS function.   |  |  | | --- | --- | | *ANSWER:* | deadlocks | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-3d Deadlocks | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 66. A(n)  \_\_\_\_\_\_ occurs when a transaction executes a query at time T1, and it runs the same query at same time T2, yielding additional rows that satisfy the query.   |  |  | | --- | --- | | *ANSWER:* | phantom read | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-6 ANSI Levels of Transaction Isolation | | *LEARNING OBJECTIVES:* | 10.07 - List and explain the ANSI levels of transaction isolation | |

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| 67. \_\_\_\_\_ ensure that a disk physical failure will not impair the DBMS's ability to recover data.   |  |  | | --- | --- | | *ANSWER:* | Redundant transaction logs | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |

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| 68. Database transaction \_\_\_\_\_ restores a database from an inconsistent state to a previously consistent state.   |  |  | | --- | --- | | *ANSWER:* | recovery | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |

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| 69. The DBMS uses the information stored in the \_\_\_\_\_ log for a recovery requirement triggered by a ROLLBACK statement, a program’s abnormal termination, or a system failure such as a network discrepancy or a disk crash.   |  |  | | --- | --- | | *ANSWER:* | transaction | | *DIFFICULTY:* | Difficulty: Easy | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |

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| 70. The \_\_\_\_\_ protocol ensures that transaction logs are always written before any database data is actually updated.   |  |  | | --- | --- | | *ANSWER:* | write-ahead-log | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |

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| 71. What is transaction isolation and why it is important?   |  |  | | --- | --- | | *ANSWER:* | Isolation means that the data used during the execution of a transaction cannot be used by a second transaction until the first one is completed. In other words, if transaction T1 is being executed and is using the data item X, that data item cannot be accessed by any other transaction (T2 ... Tn) until T1 ends. This property is particularly useful in multiuser database environments because several users can access and update the database at the same time. | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-1b Transaction Properties | | *LEARNING OBJECTIVES:* | 10.01 - Describe the database transaction management process | |

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| 72. How does a shared/exclusive lock schema increase the lock manager’s overhead?   |  |  | | --- | --- | | *ANSWER:* | The type of lock held must be known before a lock can be granted.  Three lock operations exist: READ\_LOCK to check the type of lock, WRITE\_LOCK to issue the lock, and UNLOCK to release the lock.  The schema has been enhanced to allow a lock upgrade from shared to exclusive and a lock downgrade from exclusive to shared. | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3b Lock Types | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 73. What are the three basic techniques to control deadlocks?   |  |  | | --- | --- | | *ANSWER:* | 1. Deadlock prevention. A transaction requesting a new lock is aborted when there is the possibility that a deadlock can occur. If the transaction is aborted, all changes made by this transaction are rolled back and all locks obtained by the transaction are released. The transaction is then rescheduled for execution. Deadlock prevention works because it avoids the conditions that lead to deadlocking. 2. Deadlock detection. The DBMS periodically tests the database for deadlocks. If a deadlock is found, the “victim” transaction is aborted (rolled back and restarted) and the other transaction continues. 3. Deadlock avoidance. The transaction must obtain all of the locks it needs before it can be executed. This technique avoids the rolling back of conflicting transactions by requiring that locks be obtained in succession. However, the serial lock assignment required in deadlock avoidance increases action response times. | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-3d Deadlocks | | *LEARNING OBJECTIVES:* | 10.04 - Describe how locking methods are used for concurrency control | |

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| 74. What are database checkpoints?   |  |  | | --- | --- | | *ANSWER:* | Database checkpoints are operations in which the DBMS writes all of its updated buffers to disk. While this is happening, the DBMS does not execute any other requests. A checkpoint operation is also registered in the transaction log. As a result of this operation, the physical database and the transaction log will be in sync. This synchronization is required because update operations update the copy of the data in the buffers and not in the physical database. Checkpoints are automatically scheduled by the DBMS several times per hour. Checkpoints also play an important role in transaction recovery. | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |

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| 75. How do transaction recovery procedures use the deferred-write and write-through techniques to recover transactions?   |  |  | | --- | --- | | *ANSWER:* | The database recovery process involves bringing the database to a consistent state after a failure. Transaction recovery procedures generally make use of deferred-write and write-through techniques.    When the recovery procedure uses a deferred-write technique, the transaction operations do not immediately update the physical database. Instead, only the transaction log is updated. The database is physically updated only after the transaction reaches its commit point, using information from the transaction log. If the transaction aborts before it reaches its commit point, no changes need to be made to the database because it was never updated. The recovery process for all started and committed transactions follows these steps:    1. Identify the last checkpoint in the transaction log. This is the last time transaction data were physically saved to disk.    2. For a transaction that started and was committed before the last checkpoint, nothing needs to be done because the data are already saved.    3. For a transaction that performed a commit operation after the last checkpoint, the DBMS uses the transaction log records to redo the transaction and update the database, using the “after” values in the transaction log. The changes are made in ascending order, from oldest to newest.    4. For any transaction that had a ROLLBACK operation after the last checkpoint or that was left active before the failure occurred, nothing needs to be done because the database was never updated.    When the recovery procedure uses a write-through technique, the database is immediately updated by transaction operations during the transaction’s execution, even before the transaction reaches its commit point. If the transaction aborts before it reaches its commit point, a ROLLBACK or undo operation needs to be done to restore the database to a consistent state. In that case, the ROLLBACK operation will use the transaction log “before” values. The recovery process follows these steps:    1. Identify the last checkpoint in the transaction log. This is the last time transaction data were physically saved to disk.    2. For a transaction that started and was committed before the last checkpoint, nothing needs to be done because the data are already saved.    3. For a transaction that was committed after the last checkpoint, the DBMS redoes the transaction, using the “after” values of the transaction log. Changes are applied in ascending order, from oldest to newest.    4. For any transaction that had a ROLLBACK operation after the last checkpoint or that was left active before the failure occurred, the DBMS uses the transaction log records to ROLLBACK or undo the operations, using the “before” values in the transaction log. Changes are applied in reverse order, from newest to oldest. | | *DIFFICULTY:* | Difficulty: Moderate | | *REFERENCES:* | 10-7a Transaction Recovery | | *LEARNING OBJECTIVES:* | 10.08 - Describe the role of database recovery management in maintaining database integrity | |