SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

Ramapuram Campus, Bharathi Salai, Ramapuram, Chennai - 600089

**FACULTY OF ENGINEERING AND TECHNOLOGY**

# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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**QUESTION BANK**

**DEGREE / BRANCH: B.Tech CSE**

**VI SEMESTER**

**18CSC303J – DATABASE MANAGEMENT SYSTEMS**

**Regulation – 2018**

**Academic Year -2021-2022**

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**QUESTION BANK**

**SUBJECT : 18CSC303J – DATABASE MANAGEMENT SYSTEMS**

**SEM/ YEAR : VI/III**

**Course Outcomes**

***CO1:***

***CO2:***

***CO3:***

***CO4:***

***CO5:***

***CO6:*** Appreciate the fundamental concepts of transaction processing- concurrency control techniques

and recovery procedures

| **UNIT V** | | | | |
| --- | --- | --- | --- | --- |
| Transaction concepts, properties of transactions, Serializability of transactions, testing for serializability, System recovery, Concurrency Control, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, Concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, Deadlock, Two-phase locking protocol, Isolation, Intent locking. | | | | |
| **PART-A (Multiple Choice Questions)** | | | | |
| **Q.**  **No** | **Questions** | **Course Outcome** | **Competence**  **BT Level** | **Page Number** |
| **1** | What is a collection of operations that form a single logical unit of work is defined as?   1. Views   b) Networks c) Units d) Transaction  **Answer:**  d) Transaction | CO6 | BT1 | 625 |
| **2** | The “all-or-none” property is commonly referred to as \_\_\_\_\_\_\_\_\_  a)Isolation  b)Durability  c)Atomicity  d) Consistency  **Answer:**  c)Atomicity | CO6 | BT1 | 628 |
| **3** | Which of the following is the property of transaction that protects data from system failure?  a) Consistency  b)Durability  c)Atomicity  d)Isolation  **Answer:**  b)Durability | CO6 | BT2 | 628 |
| **4** | Identify the property that the database system must provide to isolate transactions from the effects of other concurrently executing transactions.  a)Consistency  b)Durability  c)Atomicity  d) Isolation  **Answer:**  d) Isolation | CO6 | BT2 | 628 |
| **5** | Which of the following is a unit of program execution that accesses and possibly updates various data items?  a) Schedule b) View c) Transaction d) block  **Answer:**  c)Transaction | CO6 | BT2 | 628 |
| **6** | Identify the statements used to delimit a transaction.  a) begin transaction and end transaction b) start transaction and stop transaction c) get transaction and post transaction d) read transaction and write transaction  **Answer:**  a) begin transaction and end transaction | CO6 | BT3 | 629 |
| **7** | Highlight which property of the database is preserved when execution of a transaction is in isolation.  a)Concurrency  b)Durability  c)Atomicity  d) Consistency  **Answer:**  d) Consistency | CO6 | BT1 | 629 |
| **8** | What are the ACID properties of Transactions?  a)Atomicity,Consistency,Isolation,Datacentric  b)Atomicity,Consistency,Isolation,Durability  c)Atomicity,Concurrency,Inconsistent,Durability  d) Automatically, Concurrency, Isolation, Durability  **Answer:**  b)Atomicity,Consistency,Isolation,Durability | CO6 | BT2 | 628 |
| **9** | Choose who has the responsibility of ensuring consistency for an individual transaction.  a)Applicationprogrammer  b)Databasedesigners  c)Naïveusers  d) System Analyst  **Answer:**  a) Application programmer | CO6 | BT3 | 630 |
| **10** | Determine which state of the system no longer reflects a real state of the world that the database is supposed to capture because of a failure.  a) valid state b) inconsistent state c) failed state d) waiting state  **Answer:**  b)inconsistentstate | CO6 | BT3 | 633 |
| **11** | Find out to which type of file the transaction information is written as the database system keeps track on disk of the old values of any data.  a) block b) record c) log d) backup  **Answer:**  c)log | CO6 | BT1 | 632 |
| **12** | Select which component of the database handles atomicity of the database system.  a) storage engine b) log manager c) query processor d) recovery system  **Answer:**  d) recovery system | CO6 | BT1 | 633 |
| **13** | Choose the component of the database system that ensures the isolation property.  a) concurrency-control system b) Optimization engine c) query processor d) recovery system  **Answer:**  a)concurrency-control system | CO6 | BT3 | 636 |
| **14** | When a transaction may not always complete its execution successfully it is termed as\_\_\_\_\_  a) committed b) aborted c) rollback d) active  **Answer:**  a)aborted | CO6 | BT1 | 634 |
| **15** | To which state does the transaction move to once the changes caused by an aborted transaction have been undone?  a) committed b) aborted c) rollback d) active  **Answer:**  c)rollback | CO6 | BT2 | 634 |
| **16** | Which of the following is not a state in transaction? a) Active b) Terminated c) Aborted d) Partially committed  **Answer:**  b)Terminated | CO6 | BT3 | 634 |
| **17** | In which of the below states a transaction is said to have terminated?  a) active b) Terminated c) either committed or aborted d) Partially committed  **Answer:**  c)either committed or aborted | CO6 | BT2 | 634 |
| **18** | Find out the good reason for allowing concurrency?  a) Improved throughput and reduced waiting time b) improved response time c) reduce throughput loss d) increase execution time  **Answer:**  a)Improved throughput and reduced waiting time | CO6 | BT1 | 636 |
| **19** | When the number of transactions executed increases in a given amount of time, it is defined as\_\_\_\_\_  a) average response time b) throughput c) disk utilization d) latency  **Answer:**  b)throughput | CO6 | BT1 | 636 |
| **20** | Performing concurrent execution of transaction reduces\_\_\_\_\_  a) waiting time b) buffer time c) queue time d) evaluation time  **Answer:**  a)waiting time | CO6 | BT3 | 639 |
| **21** | Serializability of schedules can be ensured through a mechanism called\_\_\_\_\_  a) evaluation control policy b) concurrency control policy c) execution control policy d) cascading control policy  **Answer:**  b) concurrency control policy | CO6 | BT1 | 641 |
| **22** | A schedule can be tested against the conflict serializability by constructing a \_\_\_\_\_\_\_  a) histogram b) gantt chart c) precedence graph d) bar graph  **Answer:**  c)precedence graph | CO6 | BT3 | 641 |
| **23** | If a schedule S can be transformed into a schedule S’ by a series of swaps of non-conflicting instructions, then S and S’ are a) Non conflict equivalent b) Equal c) Conflict equivalent d) Isolation equivalent  **Answer:**  c)Conflict equivalent | CO6 | BT2 | 641 |
| **24** | I and J are \_\_\_\_\_\_\_\_\_ if they are operations by different transactions on the same data item, and at least one of them is a write operation. a) Conflicting b) Overwriting c) Isolated d) Durable  **Answer:**  a)Conflicting | CO6 | BT2 | 641 |
| **25** | Identify the process in which a serializability order of the transactions can be obtained by finding a linear order consistent with the partial order of the precedence graph.  a) Selection sorting b) Topological sorting c) Heap sorting d) Insertion sort  **Answer:**  b) Topological sorting | CO6 | BT1 | 644 |
| **26** | If a transaction has obtained a \_\_\_\_\_\_\_\_\_\_ lock, it can read but cannot write on the item a) Shared mode b) Exclusive mode c) Read only mode d) Write only mode  **Answer:**  a) Shared mode | CO6 | BT4 | 644 |
| **27** | On obtaining which type of lock a transaction can both read and write on the item? a) Shared mode b) Exclusive mode c) Read only mode d) Write only mode  **Answer:**  b) Exclusive mode | CO6 | BT1 | 647 |
| **28** | If a transaction can be granted a lock on an item immediately in spite of the presence of another mode, then the two modes are said to be \_\_\_\_\_\_\_\_ a) Concurrent b) Equivalent c) Compatible d) Executable  **Answer:**  c) Compatible | CO6 | BT1 | 647 |
| **29** | Which protocol indicates when a transaction may lock and unlock each of the data items? a) Locking protocol b) Unlocking protocol c) Granting protocol d) Conflict protocol  **Answer:**  a) Locking protocol | CO6 | BT2 | 651 |
| **30** | Choose which state a transaction is in if it may obtain locks but may not release any locks. a) Growing phase b) Shrinking phase c) Deadlock phase d) Starved phase  **Answer:**  a) Growing phase | CO6 | BT1 | 651 |
| **31** | What is the situation where no transaction can proceed with normal execution? a) Road block b) Deadlock c) Execution halt d) Abortion  **Answer:**  b) Deadlock | CO6 | BT1 | 665 |
| **32** | A transaction can proceed only after the concurrency control manager \_\_\_\_\_\_\_\_ the lock to the transaction a) Grants b) Requests c) Allocates d) deny  **Answer:**  a) Grants | CO6 | BT2 | 670 |
| **33** | Choose which phase a transaction is in if it may release locks but may not obtain any locks. a) Growing phase b) Shrinking phase c) Deadlock phase d) Starved phase  **Answer:**  b)Shrinking phase | CO6 | BT1 | 667 |
| **34** | If transaction Ti gets an explicit lock on the file Fc in exclusive mode, then it has an \_\_\_\_\_\_\_\_\_\_ on all the records belonging to that file. a) Explicit lock in exclusive mode b) Implicit lock in shared mode c) Explicit lock in shared mode d) Implicit lock in exclusive mode  **Answer:**  d) Implicit lock in exclusive mode | CO6 | BT3 | 679 |
| **35** | Who is responsible for assigning, policing and managing the locks used by the transactions? a) Scheduler b) DBMS c) Lock manager d) Locking agent  **Answer:**  c) Lock manager | CO6 | BT1 | 667 |
| **36** | Which type of errors causes a transaction to fail?  a) logical and system error b) logical and process error c) instance and system error d) media and system error  **Answer:**  a)logical and system error | CO6 | BT1 | 634 |
| **37** | The assumption that hardware errors and bugs in the software bring the system to a halt, but do not corrupt the nonvolatile storage contents is referred as \_\_\_\_\_\_  a) point based assumption b) fail-stop assumption c) interval based assumption d) fail-abort assumption  **Answer:**  b)fail-stop assumption | CO6 | BT2 | 722 |
| **38** | The log is a sequence of \_\_\_\_\_\_\_\_\_ recording all the update activities in the database. a) Log records b) Records c) Entries d) Redo  **Answer:**  Log records | CO6 | BT1 | 632 |
| **39** | In the \_\_\_\_\_\_\_\_\_\_\_ scheme, a transaction that wants to update the database first creates a complete copy of the database. a) Shadow copy b) Shadow Paging c) Update log records d) Delete log records  **Answer:**  a) Shadow copy | CO6 | BT2 | 727 |
| **40** | The \_\_\_\_\_\_\_\_\_\_\_\_ scheme uses a page table containing pointers to all pages; the page table itself and all updated pages are copied to a new location. a) Shadow copy b) Shadow Paging c) Update log records d) Delete log records  **Answer:**  b) Shadow Paging | CO6 | BT1 | 727 |
| **41** | If a transaction does not modify the database until it has committed, it is said to use the \_\_\_\_\_\_\_\_\_\_\_ technique. a) Deferred-modification b) Late-modification c) Immediate-modification d) Undo  **Answer:**  a) Deferred-modification | CO6 | BT1 | 729 |
| **42** | If database modifications occur while the transaction is still active, the transaction is said to use the \_\_\_\_\_\_\_\_\_\_\_technique. a) Deferred-modification b) Late-modification c) Immediate-modification d) Undo  **Answer**  a) Immediate-modification | CO6 | BT2 | 729 |
| **43** | \_\_\_\_\_\_\_\_\_\_\_ using a log record sets the data item specified in the log record to the old value. a) Deferred-modification b) Late-modification c) Immediate-modification d) Undo  **Answer:**  a)Undo | CO6 | BT2 | 670 |
| **44** | In the \_\_\_\_\_\_\_\_\_\_ phase, the system replays updates of all transactions by scanning the log forward from the last checkpoint. a) Repeating b) Redo c) Replay d) Undo  **Answer:**  a)Redo | CO6 | BT1 | 728 |
| **45** | A special redo-only log record < Ti, Xj, V1> is written to the log, where V1 is the value being restored to data item Xj during the rollback. What are these log records sometimes called as? a) Log records b) Records c) Compensation log records d) Compensation redo records  **Answer:**  c)Compensation log records | CO6 | BT1 | 736 |
| **46** | When the actions are played in the order while recording it is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_ history. a) Repeating b) Redo c) Replay d) Undo  **Answer:**  a) Repeating | CO6 | BT3 | 737 |
| **47** | The deadlock state can be changed back to stable state by using which of the following statement? a) Commit b) Rollback c) Savepoint d) Deadlock  **Answer:**  a)Rollback | CO6 | BT1 | 648 |
| **48** | When transaction Ti requests a data item currently held by Tj, Ti is allowed to wait only if it has a timestamp smaller than that of Tj (that is, Ti is older than Tj). Otherwise, Ti is rolled back (dies). this is defined as\_\_\_\_\_\_\_ a) Wait-die b) Wait-wound c) Wound-wait d) Wait  **Answer:**  a)Wait-die | CO6 | BT2 | 675 |
| **49** | When transaction Ti requests a data item currently held by Tj, Ti is allowed to wait only if it has a timestamp larger than that of Tj (that is, Ti is younger than Tj ). Otherwise, Tj is rolled back (Tj is wounded by Ti), this is termed as\_\_\_\_\_ a) Wait-die b) Wait-wound c) Wound-wait d) Wait  **Answer:**  a)Wound-wait | CO6 | BT2 | 675 |
| **50** | The situation where the lock waits only for a specified amount of time for another lock to be released is referred as\_\_\_\_\_ a) Lock timeout b) Wait-wound c) Timeout d) Wait **Answer:**  a)Lock timeout | CO6 | BT1 | 676 |
| **PART B (4 Marks)** | | | | |
| **1** | **List the ACID properties. Explain the usefulness of each.**  The database transaction system maintains the following four properties. These properties are often called the ACID properties; the acronym is derived from the first letter of each of the four properties.   * Atomicity * Consistency * Isolation * Durability   **Atomicity:** Either all operations of the transaction are reflected properly in the database, or none should be updated.  **Consistency:** Execution of a transaction in isolation preserves the consistency of the database.  **Isolation:** Even though multiple transactions may execute concurrently, the system guarantees that, for every pair of transactions *Ti* and *Tj* , it appears to *Ti* that either *Tj* finished execution before *Ti* started or *Tj* started execution after *Ti* finished. Thus, each transaction is unaware of other transactions executing concurrently in the system.  **Durability:** After a transaction completes successfully, the changes it has made to the database persist, even if there are system failures. | CO6 | BT2 | 628 |
| **2** | **Explain the distinction between the term’s serial schedule and serializable schedule.**   | **T1** | **T2** | | --- | --- | | *read(A)*  *A := A − 50*  *write(A)*  *read(B)*  *B := B + 50*  *write(B)*  *commit* | *read(A)*  *temp := A \* 0.1*  *A := A − temp*  *write(A)*  *read(B)*  *B := B + temp*  *write(B)*  *commit* |   ***Fig 3.2. Schedule 1 - A serial schedule in which T1 is followed by T2***  If the transactions are executed one at a time in the order *T*2 followed by *T*1, then the corresponding execution sequence is that of *fig 3.3*.  Again, as expected, the sum *A* + *B* is preserved, and the final values of accounts *A* and *B* are Rs. 850 and Rs. 2150, respectively.   | **T1** | **T2** | | --- | --- | | *read(A)*  *A := A − 50*  *write(A)*  *read(B)*  *B := B + 50*  *write(B)*  *commit* | *read(A)*  *temp := A \* 0.1*  *A := A − temp*  *write(A)*  *read(B)*  *B := B + temp*  *write(B)*  *commit* |   ***Fig 3.3. Schedule 2 - A serial schedule in which T2 is followed by T1***  The execution sequences which represent the chronological order, in which instructions are executed in the system, are called **schedules**.  Schedule 1 and schedule 2 are serial schedules. Several execution sequences are possible, since the various instructions from both transactions may now be interleaved. Given two transactions are executed concurrently. | CO6 | BT1 | 636 |
| **3** | **What benefit does rigorous two-phase locking provide?**   * In strict two phase locking protocol all exclusive mode locks taken by a transaction is held until that transaction commits. * Rigorous two phase locking protocol requires that all locks be held until the transaction commits. | CO6 | BT1 | 651 |
| **4** | **If deadlock is avoided by deadlock-avoidance schemes, is starvation still possible? Explain your answer.**  There are two approaches for deadlock prevention:  One approach ensures that no cyclic waits can occur by ordering the request for locks, or requiring all locks to be acquired together.  This approach required that each transaction locks all data items before it begins execution. It is required that, either all data items should be locked in one step, or none should be locked.  In a system where the selection of victims is based primarily on cost factors, it may happen that the same transaction is always picked as a victim. As a result, this transaction never completes its designated task, thus there is starvation. We must ensure that a transaction can be picked as a victim only a finite number of times. The most common solution is to include the number of rollbacks in the cost factor. | CO6 | BT1 | 665 |
| **5** | **Explain the purpose of the checkpoint mechanism. How often should checkpoints be performed?**  When a system crash occurs, we must consult the log to determine those transactions that need to be redone and those that need to be undone. In principle, we need to search the entire log to determine this information. There are two major difficulties with this approach:   * The search process is time-consuming. * Most of the transactions that, according to our algorithm, need to be redone have already written their updates into the database. Although redoing them will cause no harm, it will nevertheless cause recovery to take longer. | CO6 | BT2 | 734 |
| **6** | **What is locking and explain two phase locking protocol.**   * A transaction T must either commit at all sites, or it must abort at all sites. To ensure this property, the transaction coordinator of T must execute a commit *protocol*.   **Two-Phase Commit**   * Consider a transaction T initiated at site Si, where the transaction coordinator is Ci. * When T completes its execution—that is, when all the sites at which T has executed inform Ci that T has completed Ci starts the 2PC protocol. | CO6 | BT1 | 667 |
| **7** | **Define a transaction. Then discuss the following with relevant examples: (i) read only transaction (ii) A read write transaction**.  The order in which updates are carried out by redo is important; when recovering from a system crash, if updates to a particular data item are applied in an order different from the order in which they were applied originally, the final state of that data item will have a wrong value.  Most recovery algorithms do not perform redo of each transaction separately; instead they perform a single scan of the log, during which redo actions are performed for each log record as it is encountered. This approach ensures the order of updates is preserved, and is more efficient since the log needs to be read only once overall, instead of once per transaction. | CO6 | BT1 | 732 |
| **8** | **When do you say that the system is in deadlock? Explain.**  A system is in a deadlock state if there exists a set of transactions such that every transaction in the set is waiting for another transaction in the set. More precisely, there exists a set of waiting transactions {T0, T1, . . . , Tn} such that T0 is waiting for a data item that T1 holds, and T1 is waiting for a data item that T2 holds, and . . . , and Tn−1 is waiting for a data item that Tn holds, and Tn is waiting for a data item that T0 holds. None of the transactions can make progress in such a situation. | CO6 | BT3 | 665 |
| **PART C (12 Marks)** | | | |  |
| **1** | Show that the two-phase locking protocol ensures conflict serializability, and that transactions can be serialized according to their lock points. | CO6 | BT5 | 667 |
| **2** | Under what conditions is it less expensive to avoid deadlock than to allow deadlocks to occur and then to detect them? | CO6 | BT4 | 674 |
| **3** | Explain testing for Serializability with respect to concurrency control schemes. How will you determine whether a schedule is serializable or not. | CO6 | BT1 | 681 |
| **4** | What is concurrency Control? How is it implemented in DBMS? | CO6 | BT2 | 651 |
| **5** | Explain the properties of transactions. Illustrate the states of transactions. | CO6 | BT6 | 627 |

**Note:**

1. **BT Level –** Blooms Taxonomy Level
2. **CO – Course Outcomes**

BT1 – Remember BT2 – Understand BT3 – Apply BT4 – Analyze BT5 – Evaluate BT6 – Create