قائمة الاسئلة

نظم ادارة قواعد البيانات - المستوى الثاني -قسم نظم المعلومات - - كلية الحاسوب وتكنولوجيا المعلومات - الفترة - درجة الامتحان (40)

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1) What does the below relational algebra expression return?

$$\sigma_{DNO=5}(EMPLOYEE)$$

1) - First name, last name, and salary of all employees in the company.
2) - First name, last name, and salary of employees working in department 5.
3) + All attributes of employees in department 5.
4) - Only the department numbers of all employees.

2) What does the below relational algebra expression return?

$$\pi_{FNAME,LNAME,SALARY}(\sigma_{DNO=5}(EMPLOYEE))$$

1) - First name, last name, and salary of all employees in the company.
2) + First name, last name, and salary of employees working in department 5.
3) - All attributes of employees in department 5.
4) - Only the department numbers of all employees.

3) What does the selection (σ) operation do in relational algebra?

1) - Removes duplicate tuples from a relation.
2) + Chooses a subset of tuples based on a condition.
3) - Rearranges tuples in a relation into a new order.
4) - Merges two relations into one.

4) How does Relational Algebra help in database query optimization?

1) - It forces all databases to use the same execution plan.
2) - It replaces SQL queries entirely in modern databases.
3) - It ensures that all queries return only one tuple as output.
4) + It provides a mathematical foundation for rewriting queries in a more efficient way.

5) Which of the following is true about the Projection (π) operation?

1) - It filters tuples based on a condition.
2) + It removes duplicate tuples and keeps only the specified attributes.
3) - It combines two relations based on a join condition.
4) - It produces a Cartesian Product of two relations.

6) What is the main problem with using the Cartesian Product (×) in relational algebra?

1) - It returns only distinct values from both relations.
2) - It always removes duplicate rows.
3) - It automatically filters only related records.
4) + It produces too many meaningless tuples.

7) Which of the following best describes Materialized Evaluation in query execution?

1) - A) It evaluates multiple operations simultaneously without storing intermediate results.
2) + B) It stores intermediate results as temporary relations before executing the next operation.
3) - C) It eliminates the need for indexing in database queries.

4) - D) It is used only for transactions, not for query optimization.

8) Why is External Sorting needed in databases?
1) - A) Because databases store data in sorted order by default.
2) - B) Because sorting in memory is always slow.
3) + C) Because the data is too large to fit in main memory.
4) - D) Because external sorting reduces the number of queries needed.

9) Which factor most affects the performance of External Sorting?
1) - A) The CPU processing speed
2) + B) The number of available memory buffers.
3) - C) The number of users running queries.
4) - D) The complexity of SQL queries.

10) What is the main advantage of using Pipelining over Materialization in query execution?
1) - A) Pipelining always produces the result faster than any other method.
2) - B) Pipelining increases the number of disk I/O operations, making query execution more reliable.
3) - C) Pipelining eliminates the need for query optimization altogether.
4) + D) Pipelining requires less memory by avoiding storing intermediate results.

11) Consider the following query:
SELECT * FROM EMPLOYEE
WHERE Age > 30 AND City = 'New York';
There is an index on Age, but City is not indexed. What might happen during query execution?
1) + A) The database will always use the Age index and filter City later.
2) - B) The database will ignore the index and process both conditions together.
3) - C) Since City has no index, the database might scan the entire table because filtering by Age alone is not enough.
4) - D) The database will create a temporary index on City for better performance.

12) A database needs to sort a large file that does not fit in memory. The system has 10 memory pages available, and the file has 1000 pages.
How many initial sorted runs will be created in the first phase of External Sort-Merge?
1) - 1
2) - 1000
3) - 10
4) + 100

13) An SQL query first translated into which form before execution?
1) - A) Machine code
2) + B) Relational algebra
3) - C) Binary data
4) - D) Assembly language

14) What is the main goal of query optimization in a DBMS?
1) + A) To execute queries as fast as possible
2) - B) To ensure queries always return correct results
3) - C) To use as many indexes as possible
4) - D) To minimize the use of SQL functions

15) Why do we apply SELECT and PROJECT operations before JOIN in heuristic optimization?
1) - A) To increas the number of attributes in the result
2) - B) To ensure all joins are performed
3) + C) To minimize the size of intermediate results
4) - D) To avoid Cartesian products

16) What is the main disadvantage of a Cartesian product in query execution?
1) - It requires a secondary index

2) - It cannot be used with joins
3) + It produces a large number of unnecessary tuples
4) - D) It does not support sorting

17) Which of the following is NOT a heuristic rule in query optimization?
1) - A) Apply SELECT early
2) - B) Apply PROJECT early
3) + C) Perform Cartesian products before joins
4) - D) Use the most restrictive conditions first

18) What is the role of a query tree in query optimization?
1) - A) It stores query results
2) + B) It represents query execution steps
3) - C) It executes queries directly
4) - D) It sorts all database records

19) How does heuristic optimization improve query performance?
1) - A) By removing duplicate records
2) - B) By rewriting SQL statements
3) + C) By optimizing queries based on predefined rules (مسبقا محدد قواعد)
4) - D) By storing a query result permanently

20) The schedule in the following table is an example of _____ schedule.

T_1	T_2

read_item(X);
$X := X - N$;
write_item(X);
read_item(Y);
$Y := Y + N$;
write_item(Y);
	read_item(X);
	$X := X + M$;
	write_item(X);

1) - A) Recoverable.
2) - B) Nonrecoverable.
3) - C) Serializable.
4) + D) Serial.

21) 20. _____ keeps track of transaction operations.
1) - A) Operating system.
2) + B) System log
3) - C) Database system.
4) - D) Data.

22) What is a transaction in a database system?
1) + A) A logical unit of database processing
2) - B) A single read operation
3) - C) A backup copy of a database
4) - D) A process that always modifies all records

23) In a multi-user database, transactions are processed:

1) - A) Sequentially, one at a time
2) - B) Only when no other transaction is running
3) + C) Concurrently, with possible interleaving
4) - D) Only when the database is offline

24) The schedule in the following table is an example of _____ problem.

T_1	T_2
read_item(X); $X := X - N$;	
	read_item(X); $X := X + M$;
write_item(X); read_item(Y);	
	write_item(X);
$Y := Y + N$; write_item(Y);	

1) + Lost update.
2) - Unrepeatable read.
3) - Dirty Read.
4) - Incorrect Summary.

25) What happens if a transaction is committed?
1) - The database is restored
2) - The transaction is aborted
3) - The transaction is rolled back
4) + All changes made by the transaction are permanent

26) If a transaction aborts, what should happen?
1) - A) The database should be shut down
2) + B) The operations already performed should be undone
3) - C) The transaction should be committed
4) - D) The transaction should retry automatically

27) A serial schedule is one where:
1) - A) All transactions execute at the same time
2) + B) Transactions execute one after another without interleaving
3) - C) Transactions do not use concurrency control
4) - D) Transactions execute in random order

28) The system log helps in:
1) - A) Scheduling transactions
2) - B) Monitoring user activities
3) + C) Undoing or redoing transactions during failure recovery
4) - D) Improving database indexing

29) A non-serial schedule:-
1) - A) Is always incorrect
2) - B) Executes transactions without interleaving
3) + C) May be serializable
4) - D) Cannot be recovered

30) What is the main purpose of a multilevel index?
1) - A) To increase data redundancy

2) + B) To speed up searching
3) - C) To store more data
4) - D) To replace primary indexing

31) What is a key advantage of hash indexing?
1) - It organizes data hierarchically
2) - It is better for ordered datasets
3) + It supports fast lookup (السريع البحث يدعم) for specific values
4) - It works best for range queries

32) What type of database column benefits most from a bitmap index?
1) - Columns with long text data
2) - Columns used as primary keys
3) + Columns with few distinct values
4) - Columns with many unique values

33) When should a function-based index be used?
1) - A) When sorting data in ascending order
2) - B) When all queries use primary keys
3) + C) When queries use expressions in WHERE clauses
4) - D) When using simple SELECT *statements

34) What is a key advantage of using a multilevel index over a single-level index?
1) - A) It speeds up search operations
2) + B) It removes duplicate data
3) - C) It requires no additional storage
4) - D) It simplifies database structure

35) What type of index is used at each level in a multilevel index?
1) - A) Secondary index
2) - B) Hash index
3) - C) Bitmap index
4) + D) Primary index

36) What is the purpose of an index in a database?
1) - A) To store data permanently
2) + B) To speed up record retrieval
3) - C) To replace the primary key
4) - D) To prevent data duplication

37) A secondary index can be created on which type of field?
1) - A) Only primary key
2) - B) Only ordered fields
3) + C) Any non-ordering field
4) - D) Only foreign key

38) Which statement is true about secondary indexes?
1) - A) They are always sparse
2) + B) They are based on the primary key
3) - C) They can be created on non-ordering fields
4) - D) They replace primary indexes

39) What is a major drawback of secondary indexes?
1) + A) They require additional storage space
2) - B) They can only be created on primary keys
3) - C) They do not improve performance
4) - D) They make searching slower

40) Which index type is best suited for range queries?

1) - A) Hash index
2) - B) Bitmap index
3) + C) Multilevel index
4) - D) Sparse index