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Course: GATE
Computer Science Engineering(CS)

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TOPICWISE : DATABASES-2 (GATE - 2019) - REPORTS

OVERALL ANALYSIS   COMPARISON REPORT   SOLUTION REPORT

ALL(17)	CORRECT(4)	INCORRECT(6)	SKIPPED(7)

Q. 1

Consider the following transaction involving two bank accounts x and y:

read (x);
$x = x - 50$;
write (x);
read (y);
$y = y + 50$;
write (y);

Which of the following constraints fail if transaction is fail just after write (x); operation?

Have any Doubt ?

A   Atomicity   Correct Option

Solution :
(a)
According to Atomicity either all operations of transaction are reflected properly in database, or none are. So, here transaction fails in middle so, Atomicity is fail.

B   Durability   Your answer is **Wrong**

C   Isolation

D   None of these

QUESTION ANALYTICS   +

Q. 2

Which of the following is true?

FAQ Have any Doubt ?

A   Secondary index must be dense   Your answer is **Correct**

Solution :
(a)
• Secondary index based on non key. So, must be dense.
• Clustering index based on key may be sparse also so, clustering index may be dense, but not always.
• Primary index on key with non ordering may be dense. So false

B   Clustering index must be dense

C   Primary index must be sparse

D   Both (a) and (c)

QUESTION ANALYTICS   +

Q. 3

Consider a relation Employees and assertion A be declared by the following:

CREATE TABLE Employees (
name CHAR (50) PRIMARY KEY,
dept CHAR (20),
salary INT
);
CREATE ASSERTION A CHECK ('Toy' IN (
            SELECT dept
            FROM Employees
            GROUP BY dept
            HAVING AVG (salary) ≥ 50000)
);

Which of the following best describes the constraints enforce by this assertion?

FAQ Have any Doubt ?

A   Every employee making atleast $ 50000 must be in the Toy department.

B   Only the Toy department may have an average salary of $ 50000 or more.

C   The average salary of employees in the Toy department is atleast $ 50000.   Correct Option

Solution :
(c)
Assertion check in "Toy department", average salary of employees should be greater than or equal to 50000 or not.
• Output is valid if condition is true.
• Output is invalid if condition is false.

D   The average salary in each department other than the Toy department is less than $50000.

QUESTION ANALYTICS   +

Q. 4

Consider two relations R(A, B, C) and S(B, D) with R contains 5000 tuples stored in a sequential file sorted on attribute A and S contain 100000 tuples stored in a sequential file sorted on attribute B. Each block can hold 10 R tuples or 10 S tuples. Which one of the following index is most appropriate for answering query $R \bowtie S$? (Assume index always stored in memory)

A   A dense index on R.B   Correct Option

Solution :
(a)

$$R \bowtie S \equiv \sigma_{R.B = S.B} (R \times S)$$

$R \bowtie S$ results tupples which are present in both relations with condition R.B = S.B. So, maximum number of tupples will be 5000 in worst case. Since R.B is non key, so. A dense index on R.B is best idea.

B   A sparse index on R.B

C   A dense index on S.B

D   A sparse index on S.B

QUESTION ANALYTICS   +

Q. 5

Consider the following relation schema:
    employee (emp-name, street, city)
    works (emp-name, company-name, salary)
    company (company-name, city)
    manages (emp-name, manager-name)
What does the following query return?
    Select a.emp-name
    From employee a, employee b, manages m
    Where a.emp-name = m.emp-name and m.manager-name = b.emp-name
        and a.street = b street and a.city = b.city;

A   Find name of employees who lives in same city as the companies for which they work.

B   Find name of employees who lives in same cities and on same streets as do their colleagues.

C   Find name of all employees who lives in same cities and on the same streets as do their managers.   Correct Option

Solution :
(c)
• a.emp-name = m.emp-name will ensure employee works under some manager.
• m.manager-name = b.emp-name will ensure manager is one of the employee of company.
• a.street = b.street will ensure both employee and their manager lives in same street.
• a.city = b.city will ensure both employee and their manager lives in same city.
So, output of query is name of all employees who lives in same city and on same streets as do their managers.

D   None of the above

QUESTION ANALYTICS   +

Q. 6

Consider a block of size such that it can hold:
• either 5 records of a relation R, or
• be used as a B^+ tree internal node with degree 11, or
• B^+ tree leaf node with degree 10.
If R has 1000 records, then the smallest number of blocks that could be used to store R and a sparse B^+ tree index on key of R is _____.

●   223   Correct Option

Solution :
223

$$\text{Number of block at database file} = \frac{1000R}{5R} = 200$$

$$\text{Number of block at leaf of } B^+ \text{ tree} = \left\lceil \frac{200}{10} \right\rceil = 20$$

$$\text{Number of block at internal nodes} = \left\lceil \frac{20}{11} \right\rceil = 2$$

$$\text{Number of block at last level} = \left\lceil \frac{2}{11} \right\rceil = 1$$

$$\text{Total number of blocks} = 200 + 20 + 2 + 1$$
$$= 223$$

QUESTION ANALYTICS   +

Q. 7

A database table T1 has 4000 records and occupies 50 disk blocks. Another table T2 has 300 records and occupies 20 disk blocks. These two tables have to be joined as per a specified join condition that needs to be evaluated for every pair of records from these two tables. The memory buffer space available can hold exactly one block of records for T1 and one block of records for T2 simultaneously at any point in time. No index is available on either table. If Nested-loop join algorithm is employed to perform the join, with the most appropriate choice of table to be used in outer loop, the number of block accesses required for reading the data are _____.

○ 15020   Correct Option

Solution :
15020

Nested Loop algorithm will involve $n_r \times b_s + b_r$ block transfers.

n_r = # records in relation r, b_r = # blocks in relation r

n_s = # records in relation s, b_s = # blocks in relation s

Either T1 can be R or T2.

If R is T1 then total number of block access is $4000 \times 20 + 50 = 80050$

If R is T2 then total number of block access is $300 \times 50 + 20 = 15020$

Better one is the second case, total number of block accesses = (15020).

📊 QUESTION ANALYTICS   +

Q. 8

Consider the following transactions:

T_1 : $w(A)$; $w(B)$; $r(C)$; C;

T_2 : $w(B)$; $r(B)$; C;

The number schedules of T_1 and T_2 recoverable are _____.

○ 20   Correct Option

Solution :
20

Schedule S is recoverable when for each pair of transaction T_i and T_j such that if T_j read data item previously written by T_i, the commit operation of T_i appears before commit operation T_j:

Case 1: Commit dependency from $C_1 \rightarrow C_2$

Now here number of possible schedule which are recoverable since T_1 does not contain read operation is:

$$\frac{5!}{3! \times 2!} = 10$$

Case 2: Commit dependency from $C_2 \rightarrow C_1$

$3 \times 2 = 6$ cases   4 cases
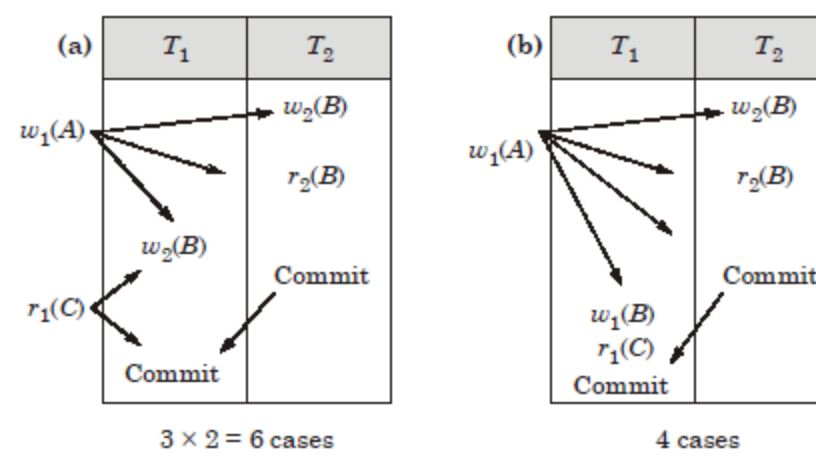
So, total recoverable schedules are $10 + 6 + 4 = 20$

●   Your Answer is 2

📊 QUESTION ANALYTICS   +

Q. 9

Consider a database that has the relation schema EMP (ID, Name, Dept_name, Salary). An instance of the schema EMP is as given below:

ID	Name	Dept_name	Salary
101	Suresh	CS	37000
102	Ramesh	EE	45000
103	Gaurav	EC	54000
104	Vamsi	EE	74000
105	Gaurav	CS	45000
106	Kunal	CS	54000
107	Suresh	CS	42000
108	Gangesh	CS	74000

The following query is made on the database:

$\{t \mid \exists\, s \in \text{EMP} \,(t[\text{ID}] = s[\text{ID}] \wedge s[\text{salary}] > 40000 \wedge s[\text{Dept\_name}] = \text{CS})\}$

The number of tupples in 't' is _____.

○ 4   Correct Option

Solution :
4

Query: $\{t \mid \exists\, s \in \text{EMP} \,(t[\text{ID}] = s[\text{ID}] \wedge s[\text{salary}] > 40000 \wedge s[\text{Dept\_name}] = \text{CS})\}$ result those employee who works in 'CS' department and whose salary is more than 40000.

So output will be:

ID
105
106
107
108

i.e. 4 records tupples.

Q. 10

Consider the following schedule S of transactions T_1, T_2, T_3 and T_4:

T_1	T_2	T_3	T_4
		Write(x)	
	Write(x)		
	Commit		
			Read(x)
Write(x)			
		Read(x)	
Commit			
		Commit	
			Commit

Which one of the following statement is correct?

FAQ | Have any Doubt ?

A   Recoverable but not conflict serializable.   Correct Option

Solution :
(a)
- Checking conflict serializable:
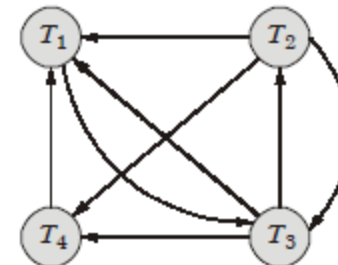
Since cycle exist in graph, so not conflict serializable.
- Checking recoverability:
Since in given schedule, no write-read pair exist where commit of read(x), comes before commit after write(x). Hence recoverable.

B   Irrecoverable but conflict serializable.

C   Irrecoverable and not conflict serializable.   Your answer is **Wrong**

D   Both recoverable and conflict serializable.

Q. 11

Consider the following statements:
S_1 : All strict schedules are serial.
S_2 : All recoverable schedules are conflict serializable.
S_3 : All strict schedules are conflict serializable.
S_4 : All conflict serializable schedules are free from cascading rollbacks.
Which of the following is true?

FAQ | Have any Doubt ?

A   Only S_1 and S_4

B   Only S_2 and S_4

C   Only S_2, S_3 and S_4

D   None of these   Your answer is **Correct**

Solution :
(d)
S_1 : All strict schedule may or may not serial i.e.

T_1	T_2
W(A)	
	W(B)
W(C)	
	W(D)
C_1	
	C_2

Schedule is strict schedule but not serial.
S_2 : All recoverable schedule need not be conflict serializable.

T_1	T_2
R(A)	
	W(A)
	R(B)
W(B)	
C_1	
	C_2

Since cycle exist, so cannot be conflict serializable.

S_3 : All strict schedule need not be conflict serializable.

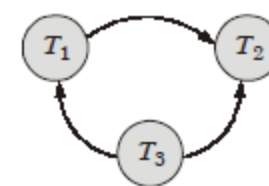| T_1	T_2
R(A)	
	W(A)
	W(B)
	C_2
R(B)	
C_1	

Schedule is strict schedule but not conflict serializable.
S_4 : All conflict serializable schedules may not free from cascading rollbacks i.e.

T_1	T_2	T_3
		W(A)
R(A)		
W(A)		
	R(A)	
	W(A)	
C_1		
	C_2	
		C_3

- Schedule is conflict serializable i.e.

  no cycle exist.
- Schedule have cascading abort.

So, none of these statement is true.

Q. 12

Consider a simple check pointing protocol and the following set of operations in the log.
(Start, T_4); (Start, T_1); (Write, T_1, a, 2, 3); (Write, T_4, b, 1, 2) (commit, T_1); (Start, T_3) (check point); (Write, T_3, C, 4, 7) (commit, T_4)
If crash happens now and the system tries to recover using both undo and redo operations, what are the contents of the undo list and redo list

Have any Doubt ? 🔖

A   Undo: $T_1 T_3$; redo : T_4

B   Undo: T_3; redo : T_4 Your answer is **Correct**

Solution :
(b)
  In data base until check point not come data is not saved permanently, when checkpoint is comes all data till checkpoint get stored permanently.
  After checkpoint process which are committed are redo and which are not committed are undo:
  So, undo is to be transaction T_3 redo is to be transaction T_4.

C   Undo: T_2; redo : T_2 ;

D   Undo: T_4; redo : T_1

Q. 13

Consider the following queries on the relational schema R(A B), S(C D)
Q_1 :   Select A
                  From R
                  Where NOT EXISTS (Select *
                              From S
                              Where R.A ≤ S.C)

Q_2 :   Select A
                  From R
                  Where A ≥ all (Select C
                        From S)

Q_3 : $\pi_A(R) - \pi_A(R \bowtie_{A \le C} S)$

Which of the following statement true?

FAQ Have any Doubt ? 🔖

A $Q_1 Q_2$ results same but not Q_3

B $Q_1 Q_3$ results same but not Q_2 Correct Option

Solution :
(b)
Q_1 : Results set of A values which are more than every value of S.
Q_2 : Results set of A values which are more than or equal to all values of S.
Q_3 : Results set of A values which are more than every values of S.

C $Q_2 Q_3$ results same but not Q_1 Your answer is **Wrong**

D $Q_1 Q_2 Q_3$ all result same

Q. 14

Consider the following schedules involving two transactions.
          S_1 : $R_1(x)$, $W_2(y)$, $R_2(x)$, $W_1(y)$, commit$_1$, commit$_2$.
      S_2 : $R_1(x)$, $R_2(y)$, $W_1(z)$, commit$_1$, $R_3(y)$, $R_3(z)$, $W_2(y)$, $W_3(x)$, commit$_2$, commit$_3$.
Which of the following statements is true?
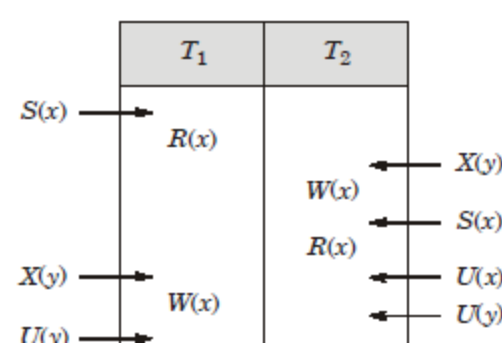
FAQ Have any Doubt ? 🔖

A   Both S_1 and S_2 are allowed under 2PL.   Correct Option
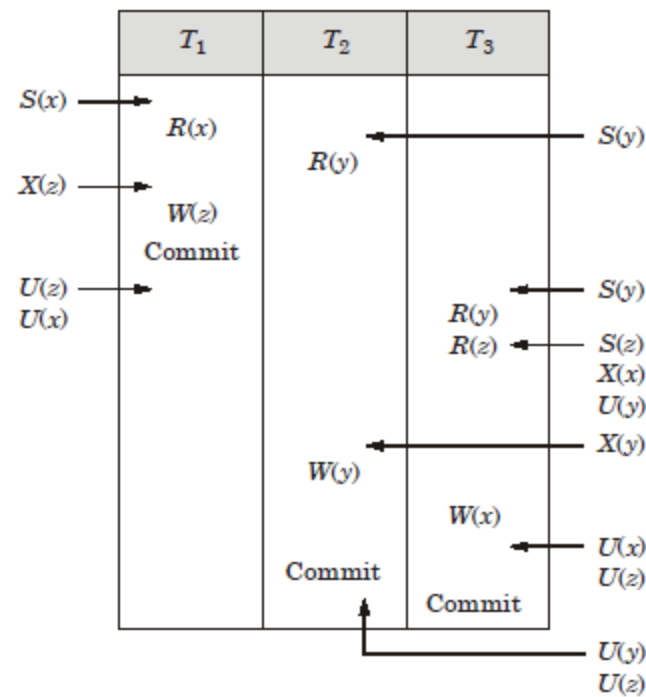
Solution :
(a)
- **Check S_1:**

Schedule S_1 is allowed under 2PL.

- Check S_2:

	T_1	T_2	T_3
$S(x)$			
	$R(x)$		
		$R(y)$	$S(y)$
$X(z)$			
	$W(z)$		
	Commit		
$U(z)$			
$U(x)$		$R(y)$	$S(y)$
		$R(z)$	$S(z)$
			$X(x)$
			$U(y)$
			$X(y)$
	$W(y)$		
		$W(x)$	
			$U(x)$
	Commit		$U(z)$
		Commit	
			$U(y)$
			$U(z)$

Schedule S_2 is allowed under 2PL.

B — Only S_2 is allowed under 2PL.   Your answer is **Wrong**

C — Only S_1 is allowed under 2PL.

D — Neither S_1 nor S_2 allowed under 2PL.

📊 QUESTION ANALYTICS   +

Q. 15

Consider the following relation schema Instructor (ID, Name, Dept_name, Salary) with table:

ID	Name	Dept_name	Salary
101	Crick	IN	72000
102	Katz	CS	75000
103	Srinivas	CS	32000
104	Brandt	CS	25000
105	Kim	EE	42000
106	Singh	EC	48000
107	Gold	EC	34000
108	Mozart	CE	70000
109	Gaurav	CE	20000
110	Kunal	CE	50000

Consider the following SQL query:

SELECT Dept_name, avg_salary
FROM (SELECT Dept_name, avg (Salary) as avg_salary
      FROM Instructor
      GROUP by Dept_name)
WHERE avg_salary > 42000;

The number of tupple returned by above SQL query is _____.

Have any Doubt ? 🔖

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3   Your answer is **Correct 3**

Solution :

3

1. Query: (SELECT Dept_name, avg (Salary) as avg_salary
      FROM Instructor
      GROUP by Dept_name)
will return department name with their average salary.

2. Outside query return department name with average salary whose average salary more than 42000.
i,e. IN, CS, CE.

📊 QUESTION ANALYTICS   +

Q. 16

Consider a disk block of size 1024 bytes. A block pointer is 6 bytes long. A file has 30000 Employee record of fixed length and each record of size 100 bytes. Assume an unspanned organization is used to store records and SSN takes 9 bytes. Suppose that file is ordered by the key field SSN and sparse primary index is used. The number of block accesses needed to search and retrieve a record from the Employee file, given its SSN value using primary index are _____.

Have any Doubt ? 🔖

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7   Correct Option

Solution :

7

Number of blocks to store whole records

$$= \left\lceil \frac{30000 \times 100}{1024} \right\rceil = \lceil 2929.68 \rceil$$

$$= 2930$$

Since sparse index is used:
Block factor at 1st level for unspanned organization

$$= \left\lfloor \frac{1024}{6+9} \right\rfloor = 68$$

Number of blocks at 1st level

$$= \left\lceil \frac{2930}{} \right\rceil = \lceil 43.08 \rceil = 44$$

Now number of block access with primary index is
$$= \log (44) + 1$$
$$= 6 + 1 = 7$$

Q. 17

Consider the following schedule:

$S : r_1(A); w_1(B); r_2(A); w_2(B); r_3(A); w_3(B);$

Here $r_i(X)$ denotes read on data item X and $w_i(X)$ denotes write operation on data item X. The total number of schedules that are view equivalent to S are _____.

Have any Doubt ?

30   Correct Option

Solution :
30

- **Final write:**

  On B: T_3 So, $\left. \begin{array}{l} \end{array} \right\} \left(\begin{array}{l} T_1 \to T_2 \to T_3 \\ T_2 \to T_1 \to T_3 \end{array} \right)$

  On A: No one

- **No write read pair present**
- **Initial read**

  On A: T_1, T_2, T_3

  On B: No one

So, number of schedule possible: $T_2 \to T_1 \to T_3$ and $T_1 \to T_2 \to T_3$

Now check view equivalent to S:

1. $T_1 \to T_2 \to T_3$

     $w_1(B)$

(i) $r_2(A)$ $w_2(B)$ $r_3(A)$ $w_3(B)$ = Here $r_1(A)$ will come in 3 ways

     w_1

(ii) $r_2(A)$ $r_3(A)$ $w_2(B)$ $w_3(B)$ = Here $r_1(A)$ will come in 6 ways

     $w_1(B)$

(iii) $r_3(A)$ $r_2(A)$ $w_2(B)$ $w_3(B)$ = Here $r_1(A)$ will come in 6 ways

           Total ways $= 3 + 6 + 6$

                    $= 15$ ways

Similarly for $T_2 \to T_1 \to T_3$ 15 ways are possible.

So total number of view equivalent schedules are 15 + 15 = 30.

Your Answer is 1