

01. What is the condition for the below expression to be true?

$$\begin{aligned}\pi_x(\pi_y(R)) &= \pi_y(\pi_x(R)) = \pi_y(\pi_x(R)) \\ &= \pi_x(\pi_y(\pi_z(R)))\end{aligned}$$

(a)  $y \subseteq z, x \subseteq z, y = x$

(b)  $y \subseteq z, x \subseteq z, x \subset y$

(c)  $y \subseteq x, x \supseteq z, z \supseteq y$

(d)  $x \subseteq y, y \subseteq z$

①  $\xrightarrow{L \Rightarrow}$

$$\begin{aligned}\pi_n(\pi_y(r)) &= \pi_{xy}(\pi_x(r)) \\ &= \pi_y(\pi_n(r)) \\ &= \pi_x(\pi_y(\pi_z(r)))\end{aligned}$$

$$\rightarrow \pi_x(\pi_y(r)) = \pi_y(\pi_n(r)) \Rightarrow n=y$$

$$\rightarrow \pi_n(\pi_y(\pi_z(r)))$$

$$\underbrace{\hspace{10em}}_{y \subseteq z}$$

$$x \subseteq z$$

②

$$y \subseteq z, x \subseteq z, y=x$$

02. Consider a join of a relation R with a relation S. If R has m tuples and S has n tuples, then the maximum and minimum sizes of the join respectively are
- (a)  $m + n$  and 0
  - (b)  $m + n$  and  $|m - n|$
  - (c)  $mn$  and min of  $\{m, n\}$
  - (d)  $mn$  and 0

(d)  ~~$R \bowtie S$~~   $|R| = m$  tuples,  $|S| = n$  tuples

$m \times n \approx$  min sizes of Join —

~~(d)~~ ~~(d)~~  $m \times n \approx 0$

03. Which of the following is a false statement?

- (a) Relational algebra is a procedural language.
- (b) Tuple relational calculus and domain relational calculus are non procedural languages.
- (c) QBE is based on domain relational calculus.
- (d) QUEL is based on tuple relational calculus
- (e) None

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All statements True

None

04. Every operator in relation algebra accepts one or more relation instances as arguments and the result is always

- (a) Relation instance
- (b) Value
- (c) Sometimes relation instance, sometimes none
- (d) Operator

① 4 →

R.A accepts one or more relations instance  
Result ?

②

Relation instance

05. Consider the following three relations.

R

Q

S

Jno	Sno
J2	S1
J1	S1
J1	S2

Pno	Jno
P1	J2
P2	J1
P1	J1

Sno	Pno
S1	P1
S1	P2
S2	P1

Query:  $((R \bowtie Q) \bowtie S)$

Find out the no. of rows results comes as output for the above Query.

- (a) 4
- (b) 5
- (c) 6
- (d) None of the above values

(a)  $S \rightarrow$

$R$

$Q$

$S$

Jno	Sno	Pno	Jno	Sno	Pno
J2	S1	P1	J2	S1	P1
J1	S1	P2	J1	S1	P2
J1	S2	P1	J1	S2	P1

$$(R \bowtie Q \bowtie S) = ?$$

$(R \bowtie Q)$

Jno	Sno	Pno
J2	S1	P1
J1	S1	P2
J1	S1	P1
J1	S2	P2
J1	S2	P1

$(R \bowtie Q) \bowtie S$

Jno	Sno	Pno
J2	S1	P1
J1	S1	P1
J1	S1	P2
J1	S2	P1

(a) 4 tuples

## 06. Customer

<u>cname</u>	st	City
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## Account

<u>acno</u>	cname	bal	bname
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## Loan

lno	cname	amt	bname
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**Query (i):** Select cname From Customer  
Where cname in (Select cname  
From Account where cname =  
any(select cname From loan));

**Query (ii):** ( $\Pi_{cname}((Customer \bowtie Account)$   
 $\bowtie loan))$

**Query (iii):** ( $\Pi_{cname}(Customer \bowtie (Account$   
 $\bowtie loan)))$

**Query (iv):** Select cname From Customer C  
Where exists ((Select cname  
From loan) Intersect (Select  
cname From Account where  
cname = C.cname));

Which of the following is false statement?

- (a) Query(i) & Query(iv) gives the same result.
- (b) Query(ii) & Query(iii) gives the same result.
- (c) Query(i) and Query(iii) gives the different result.
- (d) Query(iii) & Query(iv) gives the same result.

(d) 6 →

Customer		
	cname	st   city

A count

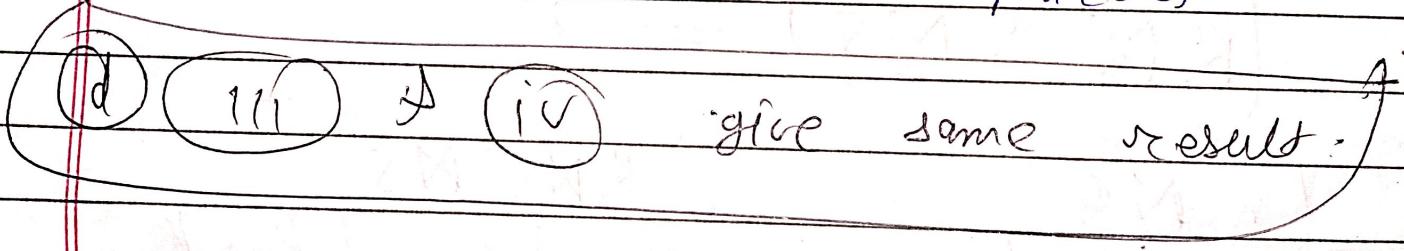
A count			
acno	cname	bal	bname

Loan

lno	cname	amt	bname
1	abc	1000	xyz

All the query, find name of customers  
who have both account & loan.

R. A - eliminate the duplicates.



## 07. Deposit

<u>acno</u>	cname	Bal	bname
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## Borrow

<u>lno</u>	cname	Amt	bname
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Query1: {t/  $\exists S \in \text{deposit} (t[\text{cname}] = S[\text{cname}]) \wedge \exists u \in \text{borrow} (s[\text{cname}] = u[\text{cname}])$ }

**Query2:**  $\{t / \exists S \in \text{deposit} \wedge \exists u \in \text{borrow}$   
 $(t[\text{cname}] = s[\text{cname}] \wedge s[\text{cname}] = u$   
 $[\text{cname}])\}$

**Query3:**  $(\Pi \text{cname} (\rho_d(\text{deposit}) \bowtie_{d.\text{cname}=b.\text{cname}}$   
 $\rho_b(\text{borrow}))\}$

**Query4:** Select cname From Deposit where  
cname in (Select cname from  
borrow)

Which of the following is a true statement?

- (a) Query1 and Query2 results are different.
- (b) Query2 and Query4 results are different.
- (c) Query2 and Query3 results are same but  
Query1 results are different.
- (d) Query1, Query2, Query3, Query4 gives  
the same result.

(d) 78

Deposit

<u>Acno</u>	<u>Cname</u>	<u>Bal</u>	<u>Bname</u>
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Borrow

<u>Inv</u>	<u>Cname</u>	<u>Amt</u>	<u>Bname</u>
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All query , find name who of customers  
who have an account & loan.

(d)

All query give same result

08. Find equivalent Relational Algebra (RA) expression for the following SQL query.

Select C.sid from catalog C, parts P  
where (P.color = red or P.color = green) and  
P.pid=C.pid

- (a)  $\Pi \text{ sid} (\sigma_{\text{color}=\text{red} \text{ or } \text{color}=\text{green}} (\text{parts}) \bowtie \text{catalog})$
- (b)  $\Pi \text{ sid} (\sigma_{\text{color}=\text{red} \text{ or } \text{color}=\text{red}} (\text{parts}) \bowtie \text{catalog})$
- (c)  $\Pi \text{ pid} (\sigma_{\text{color}=\text{red} \text{ or } \text{color}=\text{green}} (\text{parts}) \bowtie \text{catalog})$
- (d)  $\Pi \text{ pid} (\sigma_{\text{color}=\text{red} \text{ or } \text{color}=\text{green}} (\text{parts}) \bowtie \text{catalog})$

① 88 Select C.sid from catalog C, part P, where  
(P.color = red or P.color = green)  $\wedge$  P.pid = C.pid

a)  $\Pi_{sid} (\sigma_{color=red \text{ or } color=green} (Parts) \bowtie \text{catalog})$

09. If  $R = \{(1,2)\}$  and  $S = \{(1,3)\}$ ,  
then result of  $\Pi_A(R) - \Pi_B(S)$ ,

where A and B are the columns in R and S

- (a) Non empty      (b) Empty
- (c) Syntax error      (d) None of these

①  $R = \{1, 2\}$

$$R = \{1, 2\}, S = \{1, 3\}$$

$$\pi_A(R) = \pi_B(S) \rightarrow A, B \rightarrow \text{columns of } R$$

$$\{\downarrow\} \quad \{1\} - \{0\} = \{1\} \quad \text{Empty}$$

② Empty

10. Consider the RA expression  $\Pi_a(R1)$ , table R1 has attribute 'a' and rows  $N1 > 0$ .

Find the minimum and maximum rows returned by the RA expression

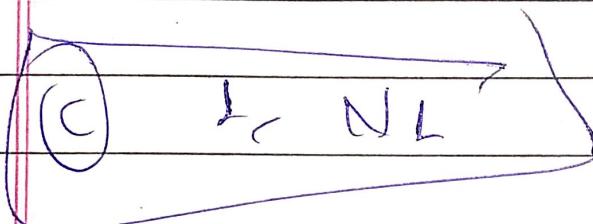
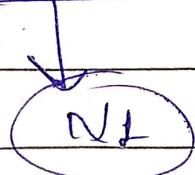
- (a) 0, 100
- (b) 0,  $N1$
- (c) 1,  $N1$
- (d)  $N1$ , 1

$\textcircled{C} \Rightarrow R_A = \pi a(R_1) \quad N_L > 0$

minimum & maximum  $N_L$



but  $N_L \leq 0$



11. Consider two relations  $R_1$ ,  $R_2$  with  $N_1$  and  $N_2$  tuples where  $N_2 > N_1 > 0$ .

What are the minimum and maximum rows for the RA expression  $R_2/R_1$ ?

- (a) 0,  $N_1/N_2$
- (b)  $N_1$ ,  $N_1/N_2$
- (c) 0,  $N_2/N_1$
- (d)  $N_2/N_1$ , 0

~~Q 11~~ relation  $R_1 \propto R_2$   
Table  $N_1 > N_2 > N_1 > 0$ .

min & max rows in for  $R_1 R_2 / R_1$

$$\min = 0, \quad \max = N_2 / N_1$$

(C) 0,  $N_2 / N_1$

12. The following two questions *involve* the three relations below:

1.  $R(a, b) = \{(0, 1), (4, 5), (8, 9)\}$ .
  2.  $S(b, c) = \{(1, 2), (5, 2), (5, 6), (5, 10), (13, 10)\}$ .
  3.  $T(c, d) = \{(2, 3), (6, 7), (10, 11), (10, 3)\}$ .

The number of tuples in  $R \bowtie S \bowtie T$ , where

$\bowtie$  is the natural join is:

- (a) 5      (b) 8  
(c) 10     (d) 13

$\textcircled{a} \rightarrow$

$$R(a, b) = S \quad R \quad S \quad T$$

$$S(b, c, g) =$$

$$T(c, d) =$$

a	b	c	d
0	1	2	3
4	5	2	7
8	9	6	11
		5	10
		10	3
		13	02

(RMS)

a	b	c
0	1	2
4	5	2
8	5	6
9	5	10

(RMS) NT

a	b	c	d
0	1	2	3
4	5	2	3
4	5	6	7
4	5	10	11
4	5	10	3

$\textcircled{a}$

S

13. Consider the following relation schemas:

PROJECT(project#, project name,  
chief\_architect) Employee Emp#,  
Emp\_name) Assigned\_to(project#, Emp#)

EMPLOYEE  $\bowtie$   $\pi_{\text{Emp}\#}$  (ASSIGNED\_TO)

$((\pi_{\text{project}\#} (\text{PROJECT}) - \bowtie (\pi_{\text{project}\#} \sigma_{\text{Emp}\# = 107} (\text{ASSIGNED\_TO})))$

The above query indicates:

- (a) Get complete details of the employees who are assigned to the projects not assigned to the employee 107.
- (b) Get complete details of the employee 107 and project handled by employee 107.
- (c) Get complete details of the employees who are assigned to the project assigned to the employee 107.
- (d) None of the above

Q 13) Project ( project #, project , name , ched - architect )  
Employee ( Emp # , Emp\_name )  
Assigned-to ( project # , Emp # )

Employee  $\bowtie_{Emp\#}$  ( Assigned-to )

(  $\pi_{Project\#}(Project) - \bowtie(\pi_{Project\#} \sigma_{Emp\# = 107} (Assigned-to))$  )

Q) Inner query finds project id's of projects  
that are assigned to employee 107.  
Outer query returns details of such employee.

Q) Get complete details of the employee  
who are assigned to the projects  
not assigned to the employee 107