COMPUTER SCIENCE

Database Management System

Query Language

Lecture_6

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01 SQL Clauses

02 SQL Operators

SQL

SELECT
FROM
WHERE
GROUP BY
HAVING
Set operator
Aggregate operator

ANY
ALL
IN
NOT IN
EXISTS
NOT EXISTS

Supplier (Sid, Sname, Rating)
Parts (Pid, Pname, Color)
Catalog (Sid, Pid, Cost)

Q. Retrieve Sid of the Supplier who supplied some Red Color Parts?

Query I:

Select Sid
From Catalog C, Parts P

WHERE P.Pid = C.Pid

Color = Red

output →

S_1
S_2

Query II:

Select Sid
From Catalog

WHERE Pid = (Select Pid
FROM Parts
WHERE Color = Red)

Pid
P_1
P_3

One to many
Comparison not
Directly allowed

IN

EXISTS.

Query III:

Select Sid
FROM Catalog
WHERE Pid

IN

(Select Pid
FROM Parts
WHEREColor = Red)

P_1
P_3

Pid
P_1
P_2

IN

Output

Sid
S_1
S_2

P_1 IN (P_1, P_3) ✓

P_2 IN (P_1 P_3) ✗

P_3 IN (P_1 P_3) ✓

P_4 IN (P_1 P_3) ✗

NOT IN

Output

Sid
S_1
S_4

Query III:

Select Sid
FROM Catalog
WHERE Pid

IN

(Select Pid
FROM Parts
WHEREColor = Red)

P_1
P_3

Pid
P_1
P_2

Output

Sid
S_1
S_2

NOT IN

Output

Sid
S_1
S_4

P_2
P_4

× P_1 NOT IN (P_1 P_3)

✓ P_2 NOT IN (P_1 P_3)

× P_3 NOT IN (P_1 P_3)

✓ P_4 NOT IN (P_1 P_3)

EXISTS: (Checks): Return True if Inner Query Result

EXISTS: (Checks): Return True if Inner Query Result Not Empty

NOT EXIST: Return True if Inner Result Empty

Correlated Nested Query: Inner Query Using attribute defined in Outer Query

```
Select   C.Sid
FROM     Catalog C
WHERE EXISTS
        (Select *
        FROM Part P
        WHERE P.Pid = C.Pid)
```

Corelated Nested Query

```
Select   C.sid
FROM     Catalog C
WHERE EXISTS ( Select*
               FROM Parts P
               WHEREP P.Pid = C.Pid
               AND Color = Red )
```

Inner Query using Attributes defined in the Outer Query

Nested Queries

(Independent)
Normal Nest Query

Inner → Outer

Bottom → Top

Corelated Nested
Query

Outer → Inner → Outer

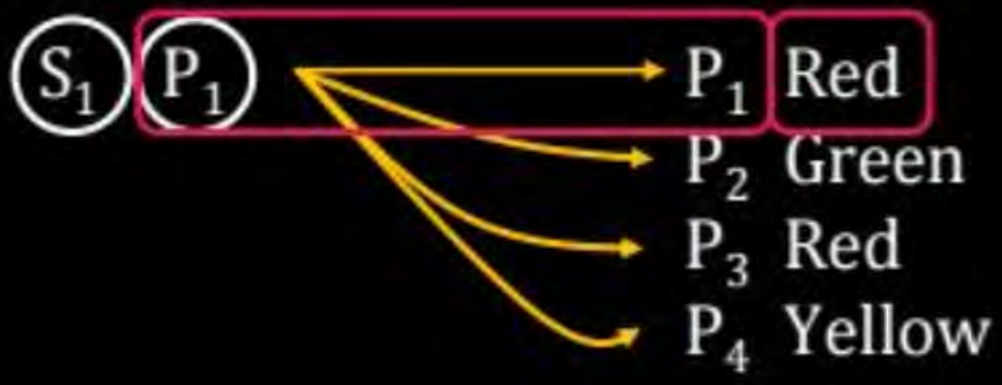
Top → Bottom → Top

```
for(i = 1; i < = n; i++)
  for(j = 1; j <= m, j++)
```


i = 1
J = 1....m
i = 2
J = 1....m
i = 3
J = 1....m
.....
i = n
J = 1....m

I[st] Iteration:

C.Pid = P.Pid AND Color = Red



[Pid Match & color = Red]

1 Tuple Return

Catalog

Sid	Pid
S_1	P_1
S_1	P_2
S_2	P_3
S_4	P_4

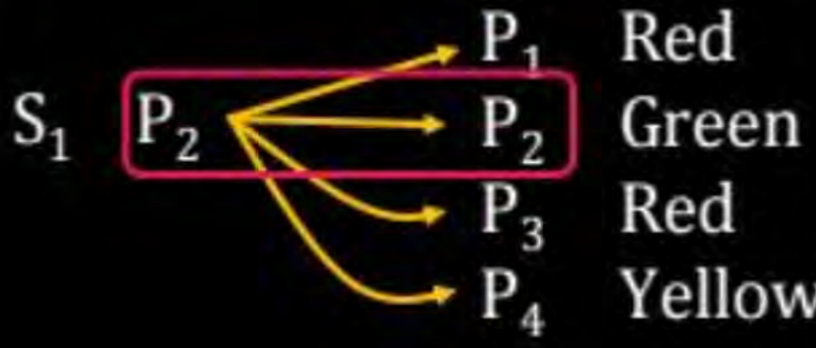
Parts

Pid	Color
P_1	Red
P_2	Green
P_3	Red
P_4	Yellow

EXIST Return True (Non Empty) ∃ S_1

NOT EXIST Return False (∵ Non Empty)

IInd Iteration:



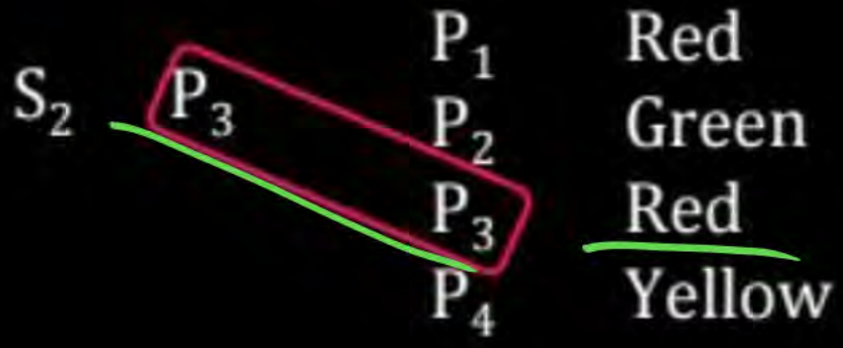
[Pid Match but color not Red]

0 Tuple Return

EXIST Return False. (Empty)

NOT EXIST Return True (Empty

IIIrd Iteration:



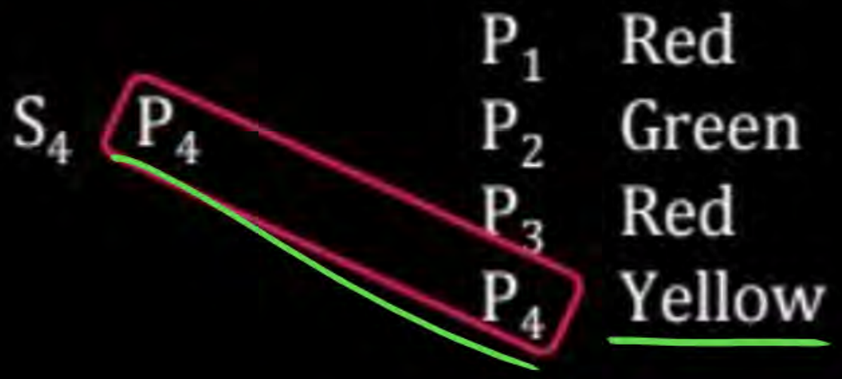
[Pid Match & Color Red]

1 Tuple Return

EXIST Return True (Rel2 Not Empty)

NOT EXIST Return False (Not Empty)

IVth Iteration:



[Pid Match but color not Red]

0 Tuple Return

EXIST Return False.

NOT EXIST Return True (Empty

EXISTS

o/p

Sid
S_1
S_2

If NOT EXIST then output

Sid
S_1
S_4

Before EXIST & NOT EXISTS No Attribute is required.

Before IN & NOT IN Attribute is Required.

Q. Given Relative Schema

Emp(Eid, Ename, Salary)

Department(Eid, dname, code)

Retrieve Employee ID who have no Department?

Which is true?

A) Q_1 ✓ Q_2 ×

B) Q_2 ✓ Q_1 ×

C) Q_1 ✓ Q_2 ✓

D) Q_1 × Q_2 ×

Query I:
```
Select   Eid
FROM     Emp E, Dep D
WHERE    E.Eid <> D.Eid
```

Query II:
```
Select   Eid
FROM     Emp E
WHERE    NOT EXISTS (Select *
                     FROM Dep D
                     WHERE E. Eid = D. Eid)
```

Q. Given Relative Schema
Emp(Eid, Ename, Salary)
Department(Eid, dname, code)
Retrieve Employee ID who have no Department?

Which is true?
A) Q_1 ✓ Q_2 ×
B) Q_2 ✓ Q_1 ×
C) Q_1 ✓ Q_2 ✓
D) Q_1 × Q_2 ×

Query I:
```
Select   Eid
FROM     Emp E, Dep D
WHERE E.Eid <> D.Eid
```

E1 <> E1
E1
E1 <> E2 true

4 X 3 = 12 Tuples

Eid
E_1
E_2
E_3
E_4

Eid	Dname
E_1	A
E_1	B
E_2	A

Query II: Select Eid
FROM Emp E
WHERE NOT EXISTS (Select *
FROM Dep D
WHERE E. Eid = D. Eid)

Query I:

$E_1 <> E_1 \rightarrow F$
$E_1 <> E_1 \rightarrow F$
$E_1 <> E_2 \rightarrow T$
$E_2 <> E_1 \rightarrow T$
$E_2 <> E_1 \rightarrow T$
$E_2 <> E_2 \rightarrow F$
$E_3 <> E_1 \rightarrow T$
$E_3 <> E_1 \rightarrow T$
$E_3 <> E_2 \rightarrow T$
$E_4 <> E_1 \rightarrow T$
$E_4 <> E_1 \rightarrow T$
$E_4 <> E_2 \rightarrow T$

Output of Query I

Eid
E_1
E_2
E_2
E_3
E_3
E_3
E_4
E_4
E_4

Output of Query II

E_3
E_4

$E_1 \rightarrow E_1$
$E_1 \rightarrow E_1$
$E_2 \rightarrow E_2$

E_3
E_4

NULL:

- Non Zero
- Unknown
- Un existed
- No Two Null are equal

Q. Retrieve Eid who does not have any Passport Details?

```
Select   Eid
FROM     Emp
WHERE PPro = NULL
```

Employee

eid	ename	PassPortNo
E1	A	20
E2	B	NULL
E3	B	16

NOTE: for comparison with NULL SQL support IS/ IS Not Clause

```
WHERE PPro IS NULL
```

Q. Retrieve Eid who are having some passport details?

```
Select  Eid
FROM    Emp
WHERE PPro IS NOT NULL
```

Regular Expression:

%: Zero or More Character

_: Exactly One character

% : Zero or More Character

'_' : Exactly One Character

Q. Retrieve Student whose Name Start with 'S' & end with M & at least 5 character?

→ 'S _ _ _ _ % M'

S _ _ _ _ % M

```
Select *
FROM Student
WHERE Sname = 'S _ _ _ % M'
```

Output: Pattern → 'S _ _ _ % M'

LIKE: is used to compare to specify certain search Condition for a Pattern in a column.

```
Select *
FROM Student
WHERE Sname LIKE 'S _ _ _ % M'
```

Q. Retrieve all student whose Name NOT Start with 'C'?

```
Select   *
FROM   Student
WHERE Sname NOT LIKE 'C%'
```

C%

```
Select   *
FROM   Student
WHERE Sname
```

LIKE

A% →	Starts with A
%J →	end with J
%I% →	Contain I
'____' →	All 4 length Name
'S___' →	Starts with S & exactly 4 length character
'S___%' →	Starts with S & at least length 4

$R \times S$:	CROSS Join
$R \cup S$:	Union Join
$R \bowtie S$:	Inner Join
$R \bowtie S$:	Outer Join

ORDER By: Order By Clause is used to sort the Rows.

Company (Name, invoice no)

Q. Display all the company in alphabetical order of their Name?

Query: Select *
FROM Company
Order by Name asc;

Q. If Reverse alphabetical order then
Order by Name Desc

Q.1

Consider the following relation schemas:

branch — b-Schema = (b-name, b-city, assets)

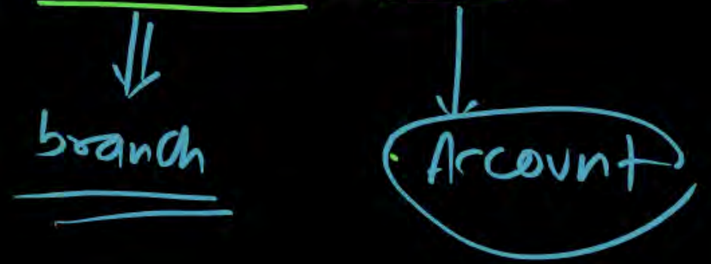
account — a-Schema = (a-num, b-name, bal)

depositer — d-Schema = (c-name, a-number)

Let branch, account and depositor be respectively instances of the above schemas. Assume that account and depositor relations are much bigger than the branch relation.

Consider the following query:

$$\Pi_{\text{c-name}} (\sigma_{\text{b-city} = \text{"agra"} \wedge \text{bal} < 0} (\text{branch} \bowtie \text{account} \bowtie \text{depositor}))$$



Which one of the following queries is the most efficient version of the above query? [GATE-2007: 2 Marks]

(A) $\Pi_{\text{c-name}}\ (\sigma_{\text{bal} < 0}\ (\sigma_{\text{b-city} = \text{"Agra"}}\ \text{branch} \bowtie \text{account}) \bowtie \text{depositor})$

(B) $\Pi_{\text{c-name}}\ (\sigma_{\text{b-city} = \text{"Agra"}}\ \text{branch} \bowtie (\sigma_{\text{bal} < 0 =}\ \text{account}) \bowtie \text{depositor})$

(C) $\Pi_{\text{c-name}}\ (\sigma_{\text{b-city} = \text{"Agra"}}\ \text{branch} \bowtie \sigma_{\text{b-city} = \text{"Agra} \wedge \text{bal} < 0}\ \text{account} \bowtie \text{depositor})$

(D) $\Pi_{\text{c-name}}\ (\sigma_{\text{b-city} = \text{"Agra"}}\ \text{branch} \bowtie (\sigma_{\text{b-city} = \text{"Agra} \wedge \text{bal} < 0}\ \text{account} \bowtie \text{depositor}))$

Ans (B)

Q.9

Consider two relations $R_1(A, B)$ with the tuples (1, 5), (3, 7)and R_2 (A, C) = (1, 7)(4, 9)

Assume that R(A, B, C) is the full natural outer join of R_1 and R_2. Consider the following tuples of the form (A, B, C); a = (1, 5, null), b = (1, null, 7), c = (3, null, 9), d = (4, 7, null), e = (1, 5, 7), f = (3, 7, null), g = (4, null, 9). Which one of the following statements is correct? [GATE-2015: 1 Mark]

	A	B	C	
a	1	5	N	a
b	1	N	7	b
c	3	N	9	c
d	4	7	N	d
e	1	5	7	e
f	3	7	N	f
g	4	N	9	g

(A) R contains a, b, e, f, g, but not c, d

(B) R contains all of a, b, c, d, e, f, g

(C) R contains e, f, g, but not a, b

(D) R contains e but not f, g

Any (C).

$R_1(AB)$

A	B
1	5
3	7

$R_2(AC)$

A	C
1	7
4	9

FULL OUTER JOIN.

	A	B	C
e	1	5	7
f	3	7	NULL
g	4	NULL	9

NAT

Consider a database that has the relation schema CR(StudentName, CourseName). An instance of the schema CR is as given below:

The following query is made on the database.

$T1 \leftarrow \pi_{CourseName}(\sigma_{StudentName='SA'}(CR))$

$T2 \leftarrow CR \div T1;$

The number of rows in T2 is ____4____.

[GATE-2017-CS: 2M]

CR	
Student Name	Course Name
SA	CA
SA	CB
SA	CC
SB	CB
SB	CC
SC	CA
SC	CB
SC	CC
SD	CA
SD	CB

Student Name	Course Name
SD	CC
SD	CD
SE	CD
SE	CA
SE	CB
SF	CA
SF	CB
SF	CC

MCQ 4

The following relation records the age of 500 employees of a company, where empNo {indicating the employee number} is the key:
empAge(empNo, age)
Consider the following relational algebra expression:
$\Pi_{empNo}(\text{empAge} \bowtie_{(age > age1)} \rho_{empNo1,age1}(\text{empAge}))$
What does the above expression generate? [GATE-2020-CS: 1M]

(A) Employee numbers of only those employees whose age is the maximum

(B) Employee numbers of only those employees whose age is more than the age of exactly one other employee

(C) Employee numbers of all employees whose age is not the minimum

(D) Employee numbers of all employees whose age is the minimum

empAge

eno	age
e_1	30
e_2	40
e_3	50

empAge1

eno1	age1
e_1	30
e_2	40
e_3	50

$$empAge \bowtie_{age > age1} (empAge1)$$

π_{eid}
e_2
e_3

e_1 : $30 > 30$ — F
e_1 : $30 > 40$ — F
e_1 : $30 > 50$ — F

e_2 : $40 > 30$ — T
e_2 : $40 > 40$ — F
e_2 : $40 > 50$ — F

e_3 : $50 > 30$ — T
e_3 : $50 > 40$ — T
e_3 : $50 > 50$ — F

NAT

Consider the following relations P(X, Y, Z), Q(X, Y, T) and R(Y, V)

P

X	Y	Z
X1	Y1	Z1
X1	Y1	Z2
X2	Y2	Z2
X2	Y4	Z4

Q

X	Y	T
X2	Y1	2
X1	Y2	5
X1	Y1	6
X3	Y3	1

R

Y	V
Y1	V1
Y3	V2
Y2	V3
Y2	V2

Ans (1)

How many tuples will be returned by the following relational algebra query?

Part I

$$[\Pi_X(\sigma_{(P.Y=R.Y \wedge R.V=V2)}(P \times R)) - \Pi_X(\sigma_{(Q.Y=R.Y \wedge Q.T>2)}(Q \times R))];$$

Part II

$X_2 - X_1 = 1$ Tuple.

[GATE-2019-CS: 2M]

MCQ

Suppose $R_1(\underline{A}, B)$ and $R_2(\underline{C}, D)$ are two relation schemes. Let r_1 and r_2 be the corresponding relation instances. B is a foreign key that refers to C in R_2. If data in r_1 and r_2 satisfy referential integrity constraints, which of the following is ALWAYS TRUE?

[GATE-2013-CS: 2M]

[6,7] − [6,7,8,9] = ϕ

(A) $\Pi_B(r_1) - \Pi_C(r_2) = \phi$

(B) $\Pi_C(r_2) - \Pi_B(r_1) = \phi$

(C) $\Pi_B(r_1) = \Pi_C(r_2)$

(D) $\Pi_B(r_1) - \Pi_C(r_2) \neq \phi$

[6,7,8,9] − [6,7] = [8,9] ≠ ϕ

[6,7) = [6,7,8,9)

[6,7) − [6,7,8,9] = ϕ

Ans (A)

A	B
1	6
2	7
3	6
4	7

Referencing Rel.

C	D
6	1
7	2
8	3
9	5

Referenced Rel.

NAT

Consider the following table named Student in a relational database. The primary key of this table is rollNum. [GATE 2023 : 2 Marks]

Student

Roll Num	Name	Gender	Marks
1	Naman	M	62
2	Aliya	F	70
3	Aliya	F	80
4	James	M	82
5	Swati	F	65

Marks > 65

Ans (2)

The SQL query below is executed on this database.

```
SELECT *
FROM Student
WHERE gender = 'F' AND marks > 65;
```

The number of rows returned by the query is

[GATE-2023-CS: 2M]

MCQ 8

Consider the following relation A, B and C:

A		
ID	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

B		
ID	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

C		
ID	Phone	Area
10	2200	02
99	2100	01

How many tuples does the result of the following relational algebra expression contain? Assume that the schema of A∪B is the same as that of A.

$(A \cup B) \bowtie_{A.Id > 40 \vee C.Id < 15} C$

Any (A)

[GATE-2012-CS: 2M]

A 7

B 4

C 5

D 9

$(A \cup B) \equiv (A)$

id	Name	Age
12	Ann	60
15	Shreya	24
99	Rohit	11
25	Hari	40
98	Rohit	20

B

ID	Phone	Area
10	2200	02
99	2100	01

A.ID > 40 ⓥ C.Id < 15

A — 5 Tuple, 3 Attr

B — 2 Tuple, 3 Attr

A × B = 5 × 2 = 10 Tuple

3 + 3 = 6 Attributes

	A.ID	A.Name	Age	B.ID	B.Phone	B.Area
1	12	Ann	60	10	2200	02
	12	Ann	60	99	2100	01
2	15	Shreya	24	10	2200	02
	15	Shreya	24	99	2100	01
3	98	Rohit	11	10	2200	02
4	98	Rohit	11	99	2100	01
5	25	Hari	40	10	2200	02
	25	Hari	40	99	2100	01
6	98	Rohit	20	10	2200	02
7	98	Rohit	20	99	2100	01

Q.9

Consider the following relation

Cinema (theatre, address, capacity)

Which of the following options will be needed at the end of the SQL query

SELECT P1.address

FROM Cinema P1

such that it always finds the addresses of theaters with maximum capacity?

[MCQ: 2015]

(A) WHERE P1.capacity >= ALL (select P2.capacity from Cinema P2)

(B) WHERE P1.capacity >= Any (select P2.capacity from Cinema P2)

(C) WHERE P1.capacity > ALL (select max (P2.capacity) from Cinema P2)

(D) WHERE P1.capacity > Any (select max (P2.capacity) from Cinema P2)

Cinema.

Theatre	Address	Capacity
T_1	A	100
T_2	B	200
T_3	C	300
T_4	D	400

(c) $x >$ ALL(400)

⇓

0TUPLE

(a) $x >$ ANY(400)

⇓

0TUPLE

$x >=$ ALL(100, 200, 300, 400)

(a) $(x >= 100)$ AND $(x >= 200)$ AND $(x >= 300)$ AND $(x >= 400)$

O/P | 400 | ⟹ maximum Capacity ① Address

(b) $x >=$ ANY(100, 200, 300, 400)

$(x >= 100)$ OR $(x >= 200)$ OR $(x >= 300)$ OR $(x >= 400)$

↳ 100, 200, 300, 400

Not getting maximum

Q10

Database table by name Loan_Records is given below:
What is the output of the following SQL query?

```
SELECT count(*)
FROM (
        SELECT Borrower, Bank_Manager
        FROM Loan_Records) AS S NATURAL JOIN
        (SELECT Bank-Manager, Loan_Amount
        FROM Loan_Records) AS T
        );
```

[MCQ: 2011:2M]

A 3

B 9

C 5

D 6

Ans (C)

LOAN RECORDS:

Borrower	Bank_Manager	Loan_Amaount
Ramesh	Sunderajan [SJ]	10000.00
Suresh	Ramgopal [RG]	5000.00
Mahesh	Sunderajan [SJ]	7000.00

Natural Join ($S \bowtie T$)

S

Borrow	Bank Mgr
Ramesh	SJ
Suresh	RG
Mahesh	SJ

$\bowtie$

T

Bank M	Loan Amt
SJ	10000
RG	5000
SJ	7000

	S.Borrow	S.BM	T.BM	T.L.A
1	Ramesh	SJ	SJ	10k
		SJ	RG	5k
2		SJ	SJ	7k
	Suresh	RG	SJ	10k
3		RG	RG	5k
		RG	SJ	7k
4	Mahesh	SJ	SJ	10k
		SJ	RG	5k
5		SJ	SJ	7k

Q. 11

SELECT operation in SQL is equivalent to

[MCQ: 2015-1M]

(A) The selection operation in relational algebra.

(B) The selection operation in relational algebra, except that SELECT in SQL retains duplicates.

Ans (D)

(C) The projection operation in relational algebra.

(D) The projection operation in relational algebra, except that SELECT in SQL retains duplicates.

Ans (D)

SQL R.A

SQL

Duplicate retain.

SELECT [DISTINCT] ≡ Projection [π]

FROM ≡ CROSS Product

WHERE ≡ Selection [σ]

Q. 12

Consider the following database table named top_scorer.

Consider the following SQL Query:

```
SELECT ta.player FROM top_scorer AS ta
WHERE ta.goals > ALL (SELECT tb.goals
        FROM top_scorer AS tb
        WHERE tb.country = 'Spain')
AND ta.goals > ANY (SELECT tc.goals
        FROM top_scorer AS tc
        WHERE tc.country = 'Germany')
```

The number of tuples returned by the above SQL query is _____.

[NAT:2017-2M]

top_scorer		
player	country	goals
Klose	Germany	16
Ronaldo	Brazil	15
G Muller	Germany	14
Fountaine	France	13
Pele	Brazil	12
Klinsmann	Germany	11
Kocsis	Hungary	11
Batistuta	Argentina	10
Cubillas	Peru	10
Lato	Poland	10
Lineker	England	10
T Muller	Germany	10
Rahn	Germany	10

ta.goal > ALL (ϕ) ⇒ ALL Tuples (13 Tuples)

AND

ta.goals > ANY (tc.goal Germany) (7 Tuples)

AND

Ans (7)

Germal Goal = (16, 14, 11, 10, 10)

to.goal > ALL (0)

AND

to.goal > ANY (16, 14, 11, 10, 10)

OR

> ANY (10)

Part I [to.goal ⇒ ALL Tuple

AND

PART II ⇒ 7 Tuples

7 Tuples.

Ans (7)

Q.13

Consider the following relations:

Student S	
Roll_No	Student_Name
1	Raj
2	Rohit
3	Raj

Performance P		
Roll_No	Course	Marks
1	Math	80
1	English	70
2	Math	75
3	English	80
2	Physics	65
3	Math	80

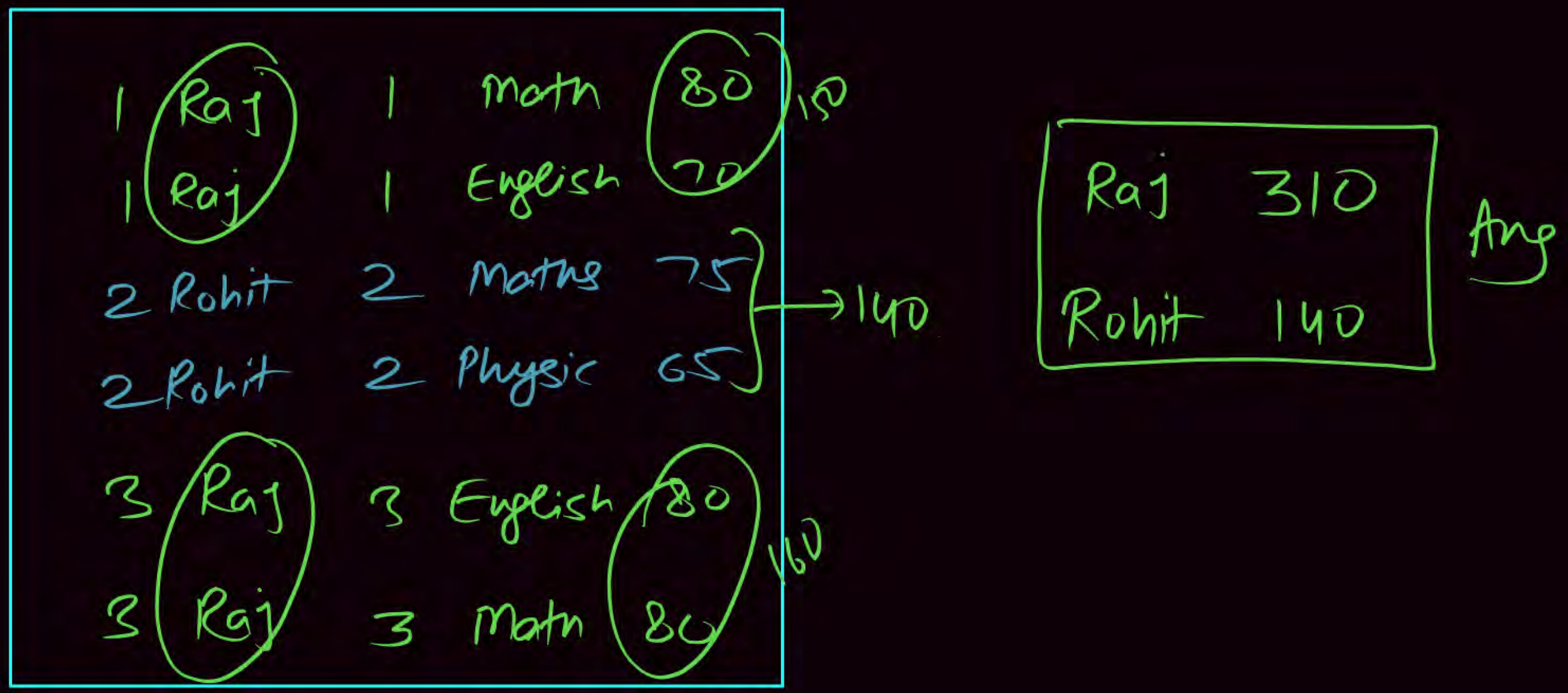
Consider the following SQL query.

```
SELECT S . Student_Name, Sum(P. Marks)
FROM Student S, Performance P
WHERE S. Roll_No = P.Roll_No
Group BY S. Student_Name
```

Avg(2)

The number of rows that will be returned by the SQL query is _____.

[NAT: 2015–2M]


1 Raj 1 Math 80
1 Raj 1 English 70
150
2 Rohit 2 Maths 75
2 Rohit 2 Physic 65
140
3 Raj 3 English 80
3 Raj 3 Math 80
160
Raj 310
Rohit 140
Ans

Q.14

Consider the relational database with the following four schemes and their respective instances.

Student(sNo, sName, dNo) Dept(dNo, dName)
Course(cNo, cName, dNo) Register(sNo, cNo)

Student

sNo	sName	dNo
S01	James	D01
S02	Rocky	D01
S03	Jackson	D02
S04	Jane	D01
S05	Milli	D02

Dept

dNo	dName
D01	CSE
D02	EEE

Course

cNo	cName	dNo
C11	DS	D01
C12	OS	D01
C21	DE	D02
C22	PT	D02
C23	CV	D03

Register

sNo	cNo
S01	C11
S01	C12
S02	C11
S03	C21
S03	C22
S03	C23
S04	C11
S04	C12
S05	C11
S05	C21

Ans (2)

Part 2 Qn D01 ⇒ C11 C12 EXCEPT

Question Continues in Next Slide

NOT EXIST : Return True if Inner Query Result Empty

EXIST: Return Return if Inner Query Non Empty.

EXCEPT (Set Difference (MINUS))

⇒ Values those are present in R But Not in S.

A, B	A, B	A, B	A, B
EXCEPT	EXCEPT	EXCEPT	EXCEPT
B, C	A, D	A, B	F, G
⟵	⟵	⟵	⟵
A	B	Empty	A, B

SQL Query:

```
SELECT * FROM Student AS S WHERE NOT EXIST
(SELECT cNo FROM Course WHERE dNo = "D01".
EXCEPT
SELECT cNo FROM Register WHERE sNo = S.sNo)
```

Query I — Set Difference — Query II

The number of rows returned by the above SQL query is 2 Ans

[NAT: 2022: 2M]

S01 S04

S05: C11 C12 EXCEPT C11 C21 → C12 ⇒ 0 Tuple Select; Not Empty

DoL: O/P Query I ⇒ C11 C12 EXCEPT

Student

S01: C11 C12 EXCEPT C11 C12 → Empty → 1 Tuple Select → Not EXISTS ⇒ Return True → S01

S02: C11 C12 EXCEPT C11 C12 → Not Empty → NOT EXIST ⇒ Return False → 0 Tuple Select

S03: C11 C12 EXCEPT C21 C22 C23 C11 C12 → Not empty → NOT EXIST Return False → 0 Tuple Select

S04: C11 C12 EXCEPT C11 C12 → Empty → NOT EXIST: Return True → 1 Tuple Select → S04

Q.15

Consider a database that has the relation schema EMP(EmpId, EmpName, and DeptName). An instance of the schema EMP and a SQL query on it are given below:

```
SELECT AVG(EC.Num)
FROM EC
WHERE(DeptName, Num) IN
        (SELECT DeptName, COUNT(EmpId) AS
                EC(DeptName, Num)
        FROM EMP
        GROUP BY DeptName)
```

The output of executing the SQL query is _____.

[NAT:2017-1M]

EMP

EmpId	EmpName	DeptName
1	XYA	AA
2	XYB	AA
3	XYC	AA
4	XYD	AA
5	XYE	AB
6	XYF	AB
7	XYG	AB
8	XYH	AC
9	XYI	AC
10	XYJ	AC
11	XYK	AD
12	XYL	AD
13	XYM	AE

EC

DeptName	Num
AA	4
AB	3
AC	3
AD	2
AE	1

$$Avg = \frac{4+3+3+2+1}{5}$$

$$= \frac{13}{5} = 2.6$$

Q.16

A relational database contains two tables Student and Performance as shown below:

Student

Roll_no	Student_name
1	Amit
2	Priya
3	Vinit
4	Rohan
5	Smita

Performance

Roll_no	Student_code	Marks
1	A	86
1	B	95
1	C	90
2	A	89
2	C	92
3	C	80

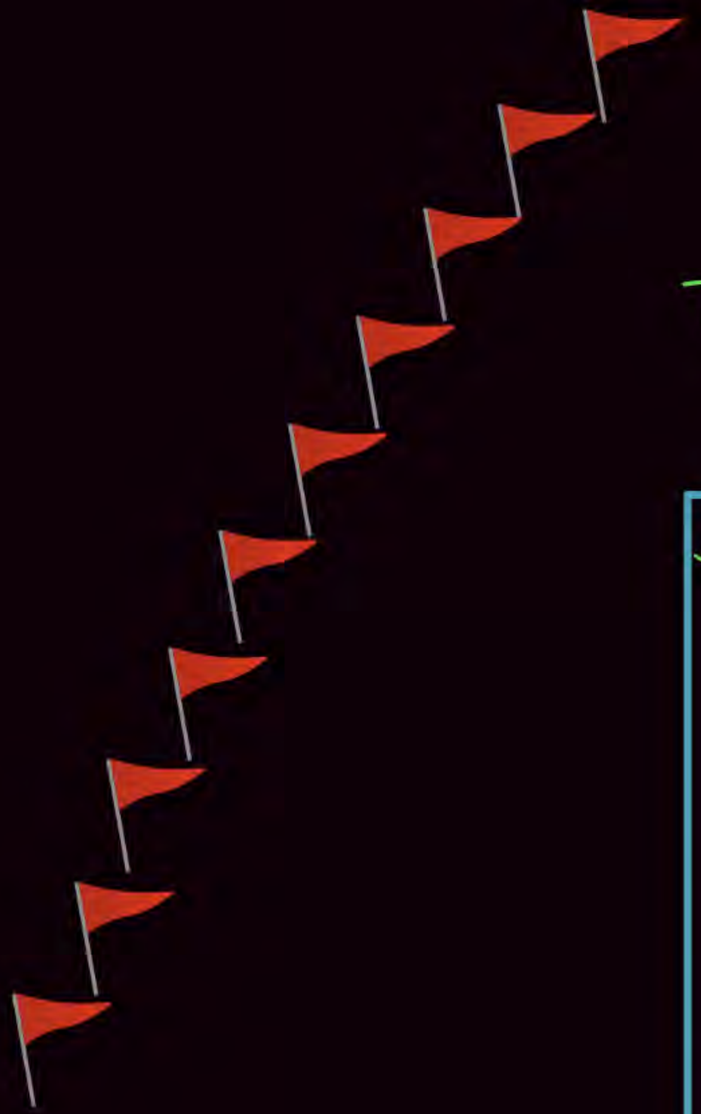
Ans (5)

The primary key of the Student table is Roll_no. For the Performance table, the columns Roll_no. and Subject_code together from the primary key. Consider the SQL query given below:

SELECT S.Student_name, sum(P.Marks) FROM Student S, Performance P
WHERE P. Marks > 84 GROUP BY S. Student_name;

The number of rows returned by the above SQL query is _____.

[NAT: 2019–2M]



Total 5×5 = 25 Tuple in output But
When group By Name

Name	Sum(marks)
Amit	452
Pooja	452
Vinit	452
Rohan	452
Smita	452

Ans (5)

Q.17

Consider the following database table named water_schemes:
The number of tuples returned by the following SQL query is:

```
with total(name, capacity) as
    select district_name, sum(capacity)
    from water_schemes
    group by district_name
with total_avg(capacity) as
    select avg(capacity)
    from total
select name
  from total, total_avg
  where total.capacity ≥ total_avg.capacity
```

water_schemes		
scheme_no	district_name	capacity
1	Ajmer	20
1	Bikaner	10
2	Bikaner	10
3	Bikaner	20
1	Churu	10
2	Churu	20
1	Dungargarh	10

[NAT:2016-2M]

Avg (2).

Total

Name	Capacity
Ajmer	20
Bikaner	40
Churu	30
Dungarah	10

$$\text{Avg} = \frac{20+40+30+10}{4}$$

$$= \frac{100}{4} = 25$$

Total Avg.

```
Select Avg(Capacity)
FROM Total
```

Total_avg

Capacity
25

Total Capacity > Total Avg Capacity

20 > 25 X

40 > 25 ✓

30 > 25 ✓

10 > 25 X

```
Select Name
FROM Total, Total Avg
WHERE
Total.Capacity > Total.avg Capacity
```

Name
Bikaner
Churu

Avg (2)

Q.18

Suppose $R_1(\underline{A}, B)$ and $R_2(\underline{C}, D)$ are two relation schemas. Let r_1 and r_2 be the corresponding relation instances. B is a foreign key that refers to C in R_2. If data in r_1 and r_2 satisfy referential integrity constraints, which of the following is ALWAYS TRUE?

[MCQ: 2012–2M]

A $\Pi_B(r_1) - \Pi_C(r_2) = \phi$

B $\Pi_C(r_2) - \Pi_B(r_1) = \phi$

C $\Pi_B(r_1) = \Pi_C(r_2)$

D $\Pi_B(r_1) - \Pi_C(r_2) \neq \phi$

Ans (A)

Q. 19

Consider a relational database containing the following schemas.

Catalogue		
sno	pno	cost
S1	P1	150
S1	P2	50
S1	P3	100
S2	P4	200
S2	P5	250
S3	P1	250
S3	P2	150
S3	P5	300
S3	P4	250

Suppliers		
sno	sname	location
S1	M/s Royal furniture	Delhi
S2	M/s Balaji furniture	Bangalore
S3	M/s Premium furniture	Chennai

Parts		
pno	**pname**	**part_spec**
P1	Table	Wood
P2	Chair	Wood
P3	Table	Steel
P4	Almirah	Steel
P5	Almirah	Wood

P4 Avg Cost = $\frac{200+250}{2}$

$= 225$

Question Continues in Next Slide

The primary key of each table is indicated by underlining the constituent fields.

```
SELECT s.no, s.name
FROM Suppliers s, Catalogue c
WHERE s.sno = c.sno AND
      cost > (SELECT AVG (cost)
              FROM Catalogue
              WHERE pno = 'p4'
              GROUP BY pno);
```

Cost > 225

The number of rows returned by the above SQL query is [MCQ: 2020-2M]

(A) 4
(B) 5
(C) 0
(D) 2

Avg(A)

S2 Balaji Furn.
S3 Rama Fur
S3 R Fur
S3 R Fur

MCQ 20

Consider a database table T containing two columns X and Y each of type integer. After the creation of the table, one record (X=1, Y=1) is inserted in the table.

Let MX and MY denote the respective maximum values of X and Y among all records in the table at any point in time. Using MX and MY, new records are inserted in the table 128 times with X and Y values being MX+1, 2*MY+1 respectively. It may be noted that each time after the insertion, values of MX and MY change.

What will be the output of the following SQL query after the steps mentioned above are carried out?

SELECT Y FROM T WHERE X=7;

[GATE-2011-CS: 2M]

A 127

B 255

C 129

D 257

Any (A).

x=7
then
y=127

mx+L

1+1=2

2+1=3

3+1=4

4+1=5

5+1=6

6+1=7

7+1=8

x	y
1	1
2	3
3	7
4	15
5	31
6	63
(7)	127
8	255

(2*my)+1

2*1+1 = 3

2*3+1 = 7

2*7+1 = 15

2*15+1 = 31

2*31+1 = 63

2*63+1 = 127

2*127+1 = 255

Any Doubt ?

THANK YOU!