Relational Algebra

→ It is developed by Dr. E.F. Codd (Father of DBMS) in 1970.
→ It is procedural query language means what to do and how to do.
→ It is also known as formal query language.
→ All SQL command based on Relational Algebra.

operations

Basic operation

- projection (π)
- selection (σ)
- cross product (x)
- Union (∪)
- Rename (ρ)
- Set Difference (−)

Derived operation

- Join (⋈)
- Intersect (∩)
- Division (/, ÷)

Π (projection operation):

→ This operation shows the list of those columns (attributes) that we wish to appear in the result.
→ Rest of the attributes (columns) are eliminated from the table.
→ It is denoted by Π.
→ This operation always display distinct result/output.

Example:

Student

Roll_NO	Name	Address	Age
101	A	Jaipur	23
102	B	Jaipur	31
103	C	Tonk	26
104	D	Kota	30

Π Address (Student)

Address
Jaipur
Tonk
Kota

Π Roll_NO, Name (Student)

Roll_NO	Name
101	A
102	B
103	C
104	D

Syntax:

Π Column1, Column2, ... (table name)

σ - (selection operation) :

→ It is denoted by σ (sigma).

→ The selection operation select records/tuples/rows that satisfy a given condition (predicate).

Syntax:

σ Condition (table name)

Example: student

Roll_NO	Name	Address	Age
101	A	Jaipur	23
102	B	Kota	31
103	C	Tonk	26
104	D	Jaipur	30

① Retrive the records of Student table whose Address is kota.

σ Address = kota (Student)

Roll_NO	Name	Address	Age
102	B	kota	31

2) Retrive the record of student table whose Address = Jaipur.

$$\sigma_{Address = Jaipur}(Student)$$

Roll_NO	Name	Address	Age
101	A	Jaipur	23
104	D	Jaipur	30

Note→ After selection, projection operation can be performed but selection operation can't be performed after projection

Ex:

$$\Pi_{Name}(\sigma_{Age > 23}(Student))$$

Name
B
C
D

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Lecture Notes

Branch : CS Sem : Subject :

Topic : Cross product Unit : 2 Lecture No

Cross product (X):

→ The Cross product is used to combine each row in one table with each row in other table.

→ It is also known as Cartesian product.
→ It is denoted by X.

Syntax:

R1 X R2

where R1 is first relation.
R2 is Second relation.

R1

A	B	C
1	a	x
2	b	y
3	c	z

R2

D	E
1	p
2	q

R1 X R2

A	B	C	D	E
1	a	x	1	p
1	a	x	2	q
2	b	y	1	p
2	b	y	2	q
3	c	z	1	p
3	c	z	2	q

ρ (Rename) :-

→ Rename operation changes the name of column in display (output) table.

→ Rename operation never renames the columns of original table.

→ In rename operation, the column names are given in sequence.

→ The column whose name is not to be changed will be written as same.

→ In SQL, the name of the column is changed by using the As statement.

Example: Student_information

Roll_No	Name	Address	Age
101	A	Jaipur	23
102	B	Kota	35
103	C	Tonk	26
104	D	Jaipur	30

ρ Enroll_NO, Full_Name, city, Age (Student)

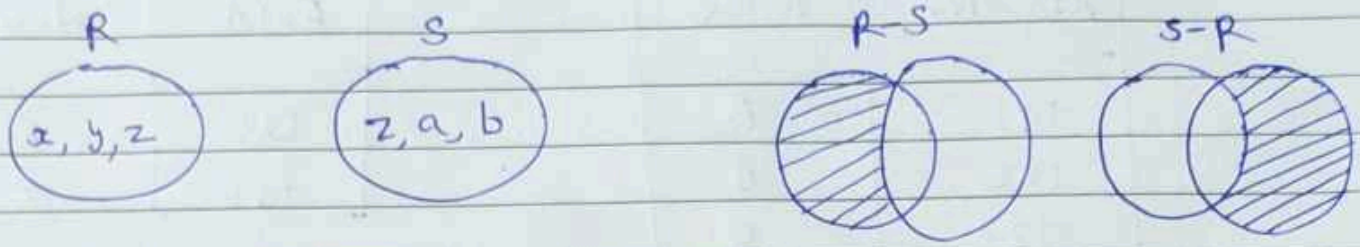
display/output table

Enroll_NO	Full_Name	city	Age
101	A	Jaipur	23
102	B	Kota	31
103	C	Tonk	26
104	D	Jaipur	30

In SQL:

```
> Select Roll_NO As Enroll_NO,
         Name    As Full_Name,
         Address As city,
         Age     As Age from Student_information
```

Set Difference (−):



R-S
x, y

S-R
a, b

$$S - R \neq R - S$$

→ The set difference operation takes two tuples and returns the value that are in first table but not in the second table.

→ The set difference operation is not commutative, that means:

$$R - S \neq S - R$$

Student

Roll_NO	Name
101	A
102	B
103	C
104	D

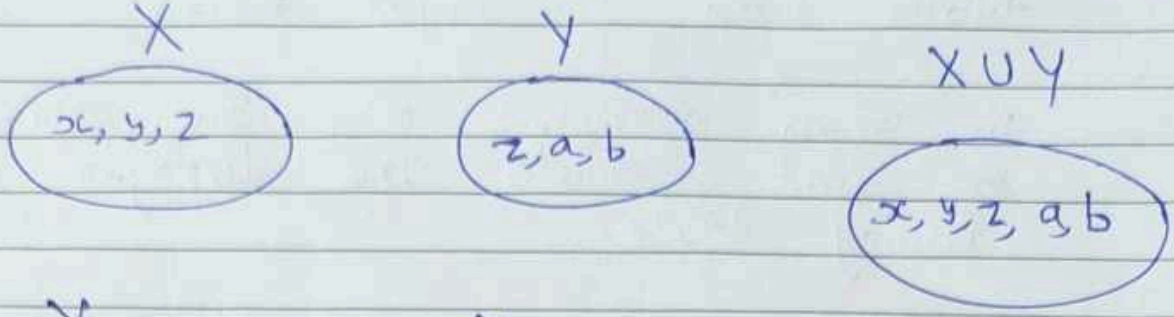
Employee

E-id	Name
101	A
108	F

Student - Employee

Roll_NO	Name
102	B
103	C
104	D
108	F

Union operation (∪):



X

R	1
S	2
T	3
U	4

Y

R	1
A	5
B	9
T	7

X ∪ Y

R	1
S	2
T	3
U	4
A	5
B	9
T	7

By Union operation, we display the records of two tables in a single table and display the ~~column~~ common record in both tables at a singal time.

in Union operation, only the column name of first table are displayed in the display table.

In Union operation, field value must be same in both tables.

Example: Student

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101	A	Jaipur	23
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102	B	Jaipur	31
103	C	Tonk	26
104	D	kota	30

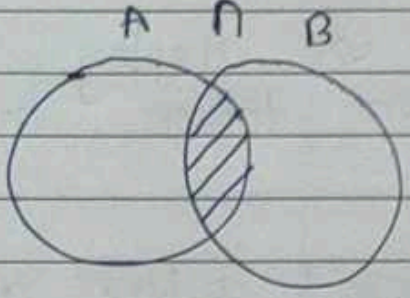
Employee

E-id	Name	city	Age
104	D	kota	30
101	F	Jaipur	31
103	C	Tonk	26
110	K	Tonk	23

Student ∪ Employee

Roll-NO	Name	Address	Age
101	A	Jaipur	23
102	B	Jaipur	31
103	C	Tonk	26
104	D	Kota	30
101	F	Jaipur	31
110	K	Tonk	23

Interseetim operation (∩):



R

A	1
B	2
C	3
D	4

S

A	1
B	8
C	5
f	10

R ∩ S

A	1

Student

Roll	Name
101	A
102	B
103	C

Employee

E-NO	Name
101	A
105	f
109	g

Student ∩ Employee

Roll	Name
101	A

→ By intersection operation we display the common records of two tables in a single table.

→ Only column name of first table are display table.

→ field value must be same in both tables.