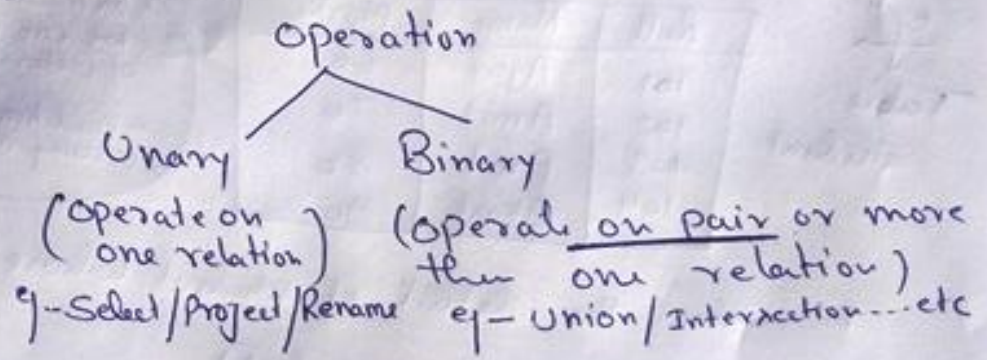


Relational Algebra

- Procedural Query Language
- It is collection of operations on relations. Each operation takes one or more relation as its operand and produces another relation as output result.



Basic/Fundamental Operations:

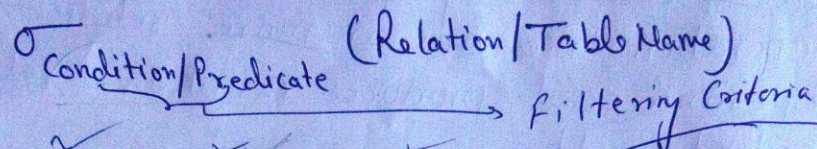
1. Select (σ)
2. Project (π)
3. Union (\cup)
4. Set Difference ($-$)
5. Cartesian Product (\times)
6. Rename (ρ)

Derived Operation:

1. Natural Join (\bowtie)
2. Left, Right, Full outer join ($\ltimes, \rtimes, \ltimes\rtimes$)
3. Intersection (\cap)
4. Division (\div)

* Select Operator (σ) denoted by Sigma(σ)

It is used to find the tuples (or rows) in a relation (or table) which satisfy the given condition



egⁿ
Table:-
Student

Roll	Name	Marks
101	Ajay	60
102	Amit	70
103	Anil	80
104	Akash	90

* Note: In select operator we can use all relational operators ($<$, $>$, $<=$, $>=$, \neq , $=$)
* Condition may be combined using and(\wedge), or(\vee)

1. Select the detail of student whose roll is 101.

$$\sigma_{\text{Roll} = 101} (\text{Student})$$

2. Select the detail of student who have scored more than 70 marks.

$$\sigma_{\text{Marks} > 70} (\text{Student})$$

* Project Operator (π)

It is used to select desired columns (or attributes)

$$\pi_{\text{Column_name}_1, \text{Column_Name}_2, \dots} (\text{table_name})$$

- egⁿ 1) Find Name of all students in above table

$$\pi_{\text{Name}} (\text{Student})$$

Note:- Project operator automatically removes duplicate values

Project (π) and select (σ) can be used simultaneously.

eg:- Find the name of student who have scored more than 80 marks.

$$\pi_{\text{name}} (\sigma_{\text{marks} > 80} (\text{Student}))$$

* Cartesian Product (\times) It combines two relation in one relation.

Let R_1 & R_2 be two Relation

R_1 R_2



eg \rightarrow	R_1	R_2	$R_1 \times R_2$	
Attributes	x	y	$x+y$	\rightarrow no. of attributes
Tuples	n	m	$n \times m$	\rightarrow no. of tuples

* Set difference ($-$) tuples (or rows) that is in relation R_1 but not in R_2 .

* Union (\cup) tuples (or rows) that is in relation R_1 or R_2 or both in $R_1 \neq R_2$.
It eliminates the duplicate tuples.

Pg-4

* Set Intersection It contains (tuples) rows that are in both R1 and R2.

* Rename Operation Used to rename the output relation. denoted by $\rho(P)$

egⁿ Rename student relation to Student1
 $\rho(\text{Student1}, \text{Student})$

Q: write queries in Relational Algebra:

Supplier (Sid, Sname, City)
parts (pid, pname, color)
orders (srd, pid, quantity)

- 1) Find names of supplier who supply some red part.
- 2) Find IDs of supplier who supply some red or green part.
- 3) Find IDs of supplier who supply some red and some green parts.
- 4) Find IDs of supplier who supply some red part or are based (belongs) at city Lucknow.
- 5) Find IDs of supplier who have ordered no parts.