SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

COURSE NAME : 23CST207 - DATABASE MANAGEMENT
SYSTEMS

II YEAR / IV SEMESTER

Unit 2- Relational Model

Topic 4 : Relational Algebra 1

Fundamental Operation in Relational Algebra are:

- Selection
- Projection
- Union
- Set Difference
- Cartesian Product
- Join

SELECTION (σ)

- The SELECT operator is σ (sigma) symbol
  Used as an expression to choose tuples that meet the selection condition...

σ<selection condition>(R)

-> Select operation selects tuples that satisfy a given predicate.

Ex:- find all employees born after 1st Jan 1950:

$$\sigma_{\text{'01/JAN/1950'}}(\text{employee})$$

PROJECTION(Π)Pi

- Π (pi) symbol used to choose attributes from a relation.
- This operator shows the list of those attributes that we wish to appear in the result and rest attributes are eliminated from the table.

$$\Pi \text{ <attribute list>(relation)}$$

SELECTION & PROJECTION Example

Person

Id	Name	Address	Hobby
1123	John	123 Main	stamps
1123	John	123 Main	coins
5556	Mary	7 Lake Dr	hiking
9876	Bart	5 Pine St	stamps

σ Hobby='stamps'(Person)

Id	Name	Address	Hobby
1123	John	123 Main	stamps
9876	Bart	5 Pine St	stamps

Π Name,Hobby(Person)

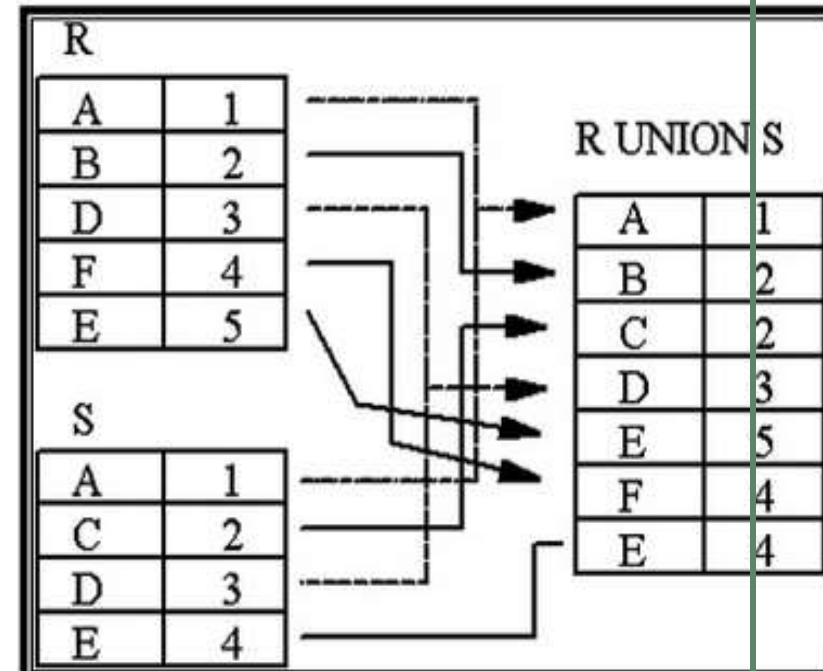| Name	Hobby
John	stamps
John	coins
Mary	Hiking
Bart	stamps

UNION (U)

- UNION is symbolized by ∪, and includes all tuples that are in R or in S, eliminating duplicate tuples, therefore set R UNION set S would be expressed as:

- RESULT ← R ∪ S

UNION Example

R	
A	1
B	2
D	3
F	4
E	5

S	
A	1
C	2
D	3
E	4

R UNION S	
A	1
B	2
C	2
D	3
E	5
F	4
E	4

Set Difference Operator (R-S)

- the MINUS operation includes tuples from one Relation that are not in another Relation and symbolized by the – (minus) symbol. Therefore R – S would be expressed as...

- RESULT ← **R – S**

R

A	1
B	2
D	3
F	4
E	5

S

A	1
C	2
D	3
E	4

R DIFFERENCE S

B	2
F	4
E	5

S DIFFERENCE R

C	2
E	4

Intersection (∩)

- The INTERSECTION operation on a relation A INTERSECTION relation B, is symbolized by **R ∩ S**, includes tuples that are only in R and S.
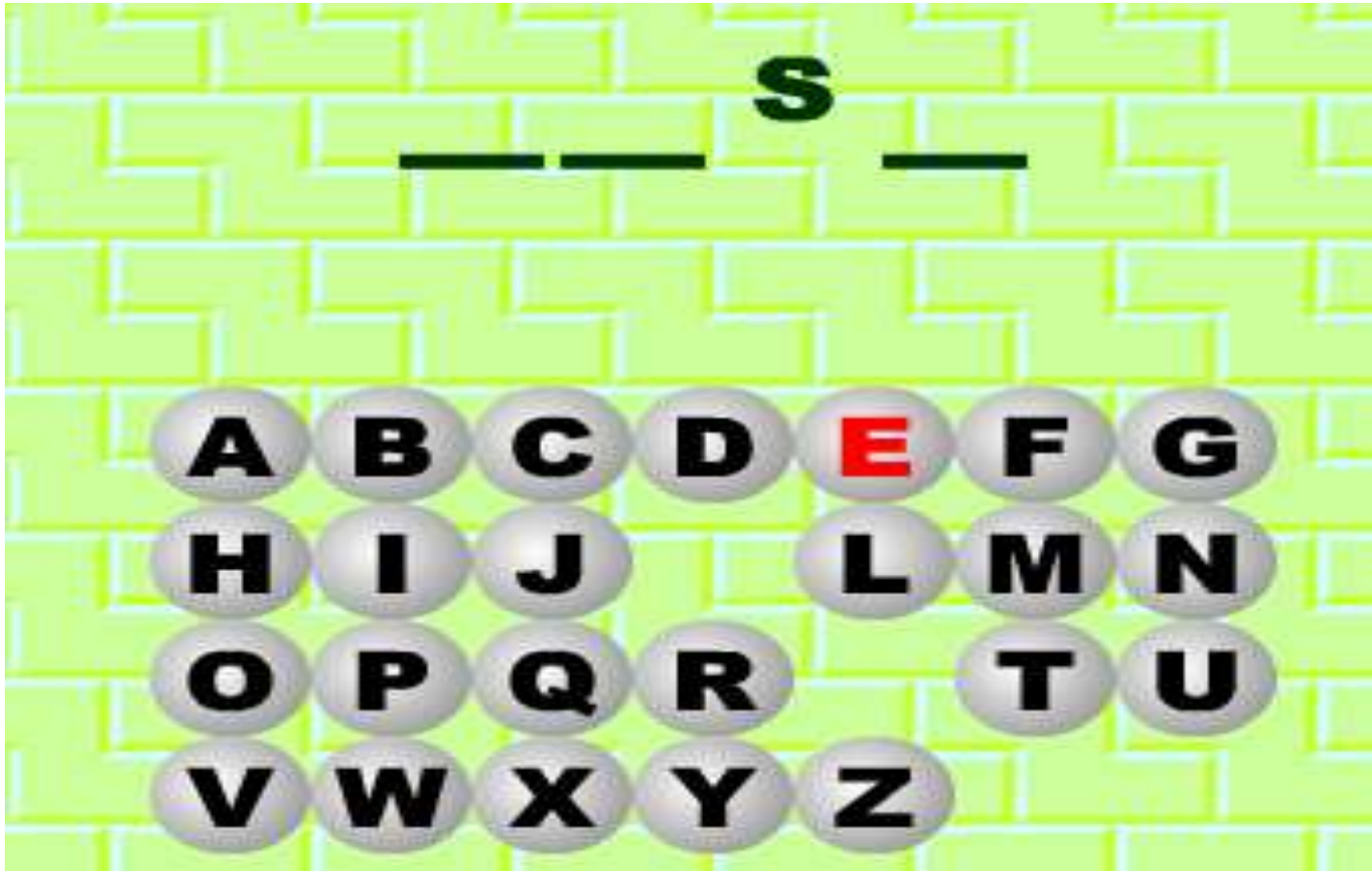- RESULT ← **R ∩ S**

R	
A	1
B	2
D	3
F	4
E	5

S	
A	1
C	2
D	3
E	4

R |NTERSECTION S

A	1
D	3

BREAK

Answer

Cartesian Product (RXS)

- Creates a relation that has all the attributes of R and S, allowing all the attainable combinations of tuples from R and S in the result. The notation used is X.
- C = R X S

R

A	1
B	2
D	3
F	4
E	5

S

A	1
C	2
D	3
E	4

R CROSS S

A	1	A	1		F	4	A	1
A	1	C	2		F	4	C	2
A	1	D	3		F	4	D	3
A	1	E	4		F	4	E	4
B	2	A	1		E	5	A	1
B	2	C	2		E	5	C	2
B	2	D	3		E	5	D	3
B	2	E	4		E	5	E	4
D	3	A	1					
D	3	C	2					
D	3	D	3					
D	3	E	4					

JOIN

- The JOIN operation is denoted by the R|X|S symbol and is used to compound similar tuples from two Relations into single longer tuples.
- Join operation is generally the cross product of two relation.
- The notation used is   R JOIN $_{join\ condition}$ S

## Types of join

- Natural Join
- Outer Join

JOIN Example

R

ColA	ColB
A	1
B	2
D	3
F	4
E	5

S

SColA	SColB
A	1
C	2
D	3
E	4

R JOIN R.ColA = S.SColA S

A	1	A	1
D	3	D	3
E	5	E	4

R JOIN R.ColB = S.SColB S

A	1	A	1
B	2	C	2
D	3	D	3
F	4	E	4

Natural Join

- The JOIN involves an equality test, and thus is often described as an equi-join. Such joins result in two attributes in the resulting relation having exactly the same value. A `natural join' will remove the duplicate attribute(s).

- In most systems a natural join will require that the attributes have the same name to identify the attribute(s) to be used in the join. This may require a renaming mechanism.

  - If you do use natural joins make sure that the relations do not have two attributes with the same name by accident.
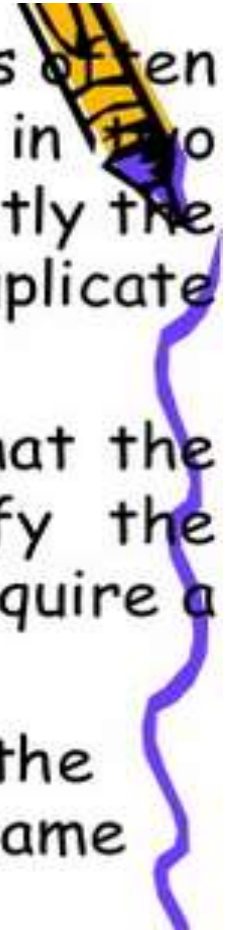
Outer Join

There are three forms of the outer join, depending on which data is to be kept.

- LEFT OUTER JOIN - keep data from the left-hand table
- RIGHT OUTER JOIN - keep data from the right-hand table
- FULL OUTER JOIN - keep data from both tables

R	ColA	ColB
	A	1
	B	2
	D	3
	F	4
	E	5

R LEFT OUTER JOIN   R.ColA = S.SColA   S

ColA	ColB	SColA	SColB
A	1	A	1
D	3	D	3
E	5	E	4
B	2	-	-
F	4	-	-

S	SColA	SColB
	A	1
	C	2
	D	3
	E	4

R RIGHT OUTER JOIN   R.ColA = S.SColA   S

ColA	ColB	SColA	SColB
A	1	A	1
D	3	D	3
E	5	E	4
-	-	C	2

Relational Algebra

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Answer

- Unary Relational Operations
- Relational Algebra Operations
- Binary Relational Operations
- Additional Relational Operations
- Queries in Relational Algebra
- Tuple Relational Calculus
- Domain Relational Calculus

- Relational Calculus

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THANK YOU