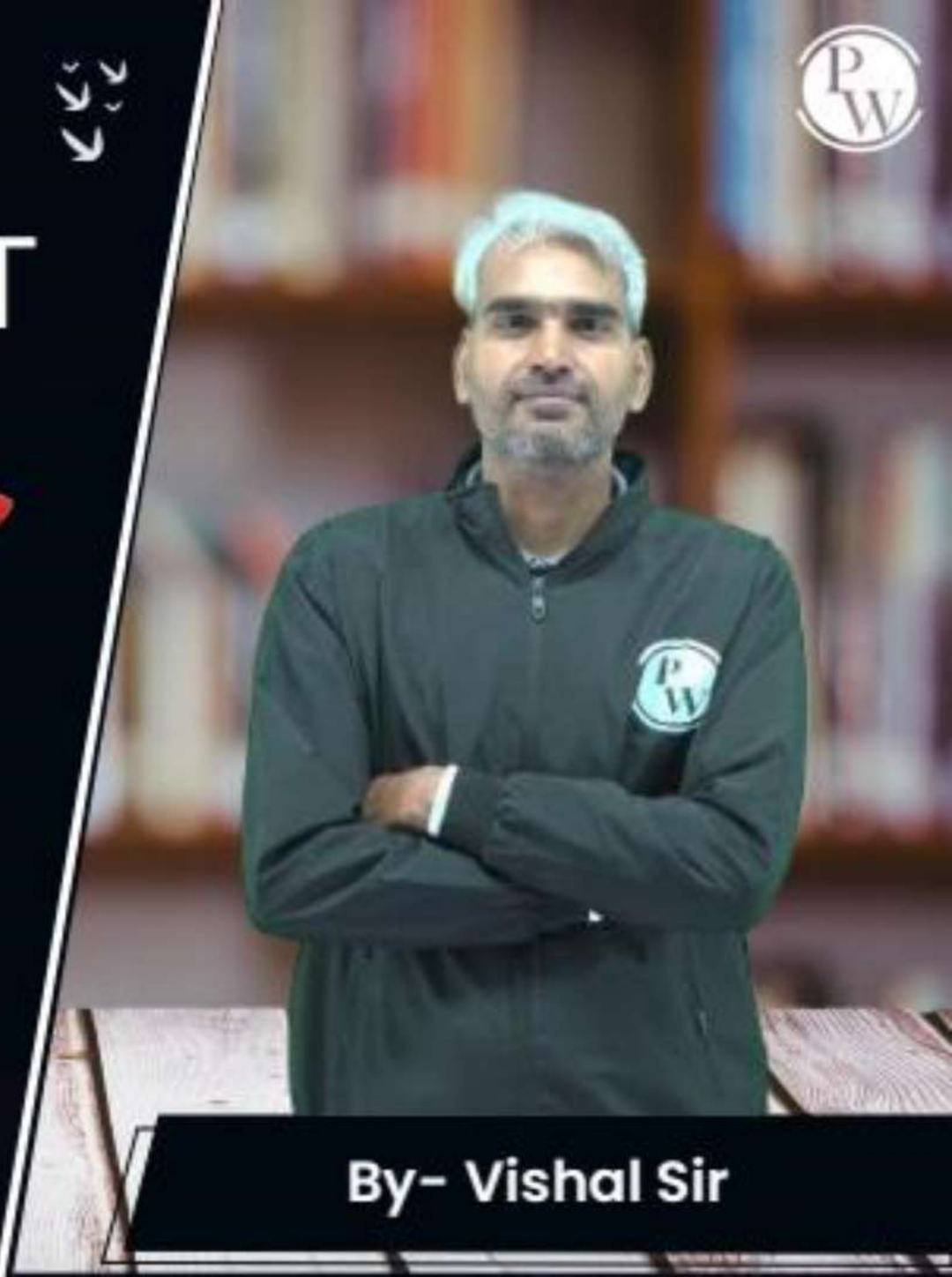
Computer Science & IT

Database Management System

Query Languages

Lecture No. 03



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Recap of Previous Lecture

Topic Derived relational algebra operations

Topic Join operations

Slide

Topics to be Covered

Topic Division operation

Topic Practice questions

Slide

Topic : Division (÷)

It is a derived relational algebra opn.

Topic : Division (÷)

Division operation is used whenever the query is with respect to every or all.

Division :-

Student (S)

Sid	Sname
S_1	A
S_2	A
S_3	B
S_4	C

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

Division :-

Query :- Retrieve Sids of all the students

π_{sid} (Student) =

Sid
S_1
S_2
S_3
S_4

Student (S)

Sid	Sname
S_1	A
S_2	A
S_3	B
S_4	C

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Division :-

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

Query :- Retrieve Sids of students who enrolled for some Courses.

(At least one (one or more))

π_{sid} (Enroll) =

O/P

Sid
S_1
S_2
S_3

Division :-

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

Query :- Retrieve Course ids of all the Courses

π_{cid} (Course) =

O/P

Cid
C_1
C_2
C_3

Query :-

π_{cid} (Enroll) =

O/P

Cid
C_1
C_2
C_3

It will o/p the Cids of Courses for which at least one student has Enrolled

Division :-

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

Query:- Retrieve Sids of students who have enrolled for all Courses.

Here we are looking for Sids in Enroll table which are associated with all Cids present in Course table.

By observing the given relational table we can say that o/p will be S_1, but we need generalize query.

w.r.t. all we can use division operation

Correct query will be

$$\pi_{Sid,Cid}(Enroll) \div \pi_{Cid}(Course)$$

If we execute this query on the given data in the relational tables then o/p will be S_1

Division :-

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

Cross product

$\pi_{Sid}(Enroll) \times \pi_{Cid}(Course) =$

Sid
S_1
S_2
S_3

Sids of students who enrolled for some Courses.

$\times$

Cid
C_1
C_2
C_3

Cids of all the Courses

$=$

Sid	Cid
S_1	C_1
S_1	C_2
S_1	C_3
S_2	C_1
S_2	C_2
S_2	C_3
S_3	C_1
S_3	C_2
S_3	C_3

It is the universal set

In this relation the students who enroll for at least one Coure have been associated with all Courses

i.e. the situation in which Every student of Enrolled table enrolled for every Course

Division :-

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

π_{sid} [$\pi_{sid}(E) \times \pi_{cid}(C)$ $-$ $\pi_{sid, cid}(E)$]

Sid
S_2
S_3

Sids of Students who did not enroll for all Courses.

Sid	Cid
S_1	C_1
S_1	C_2
S_1	C_3
S_2	C_1
S_2	C_2
S_2	C_3
S_3	C_1
S_3	C_2
S_3	C_3

When Every Student Enrolled for Every Course

Sid	Cid
S_2	C_3
S_3	C_1
S_3	C_2

In this table we will get the information that Which student did not Enroll for what Courses

Sid	Cid
S_1	C_1
S_2	C_1
S_1	C_2
S_2	C_2
S_1	C_3
S_3	C_3

Actual Enrollment information

In the result of this subtraction, we will have the Sids of only those students who did not Enroll for all Courses.

↓

i.e. we will get Sids of students who enrolled for proper subset of Courses, along with the Course ids for which they did not Enroll

Division.

Enroll (E)

Sid	Cid	fee
S_1	C_1	
S_2	C_1	
S_1	C_2	
S_2	C_2	
S_1	C_3	
S_3	C_3	

Course (C)

Cid	Cname
C_1	OS
C_2	DM
C_3	DBMS

$$[\pi_{Sid}(E) - \pi_{Sid}[\pi_{Sid}(E) \times \pi_{Cid}(C) - \pi_{Sid,Cid}(E)]]$$

$\pi_{Sid}(E)$

Sid
S_1
S_2
S_3

Students who enrolled for some Courses.

π_{Sid}

Sid
S_1

Sids of Students who enrolled for all Courses

Sid
S_2
S_3

Sids of Students who did not enroll for all courses.

$\pi_{Sid}(E) \times \pi_{Cid}(C)$

Sid	Cid
S_1	C_1
S_1	C_2
S_1	C_3
S_2	C_1
S_2	C_2
S_2	C_3
S_3	C_1
S_3	C_2
S_3	C_3

When Every Student Enrolled for Every Course

$\pi_{Sid,Cid}(E)$

Sid	Cid
S_1	C_1
S_1	C_2
S_2	C_1
S_2	C_3
S_3	C_2
S_3	C_3

Actual Enrollment information

Sid	Cid
S_2	C_3
S_3	C_1
S_3	C_2

In this table we will get the information that Which student did not Enroll for what Courses

$$\{\pi_{sid,cid}(E) \div \pi_{cid}(C)\} = [\pi_{sid}(E) - [\pi_{sid}\{(\pi_{sid}(E) \times \pi_{cid}(C)) - \pi_{sid,cid}(E)\}]]$$

① ⑧ ⑦ ② ④ ③ ⑥ ⑤

✓

Consider the following relational tables:

Supplier (Sid, Sname, Rating)

Contains the information about all Suppliers

Sid → i.e. Primary Key

Parts (Pid, Pname, Color)

info about all parts

Pid → Primary Key

Catalog (Sid, Pid, Cost)

Sid, Pid → Together they define Primary Key

it Contains the information that which Supplier has supplied what parts along with Cost.

Supplier

Sid	Sname	Rating
S_1	A	3
S_2	A	5
S_3	B	7
S_4	C	0

Parts

Pid	Pname	Color
P_1	ABC	Red
P_2	XYZ	Gracen
P_3	KBC	Red

Catalog

Sid	Pid	Cost
S_1	P_1	20
S_1	P_2	30
S_2	P_2	30
S_3	P_2	20
S_3	P_3	10

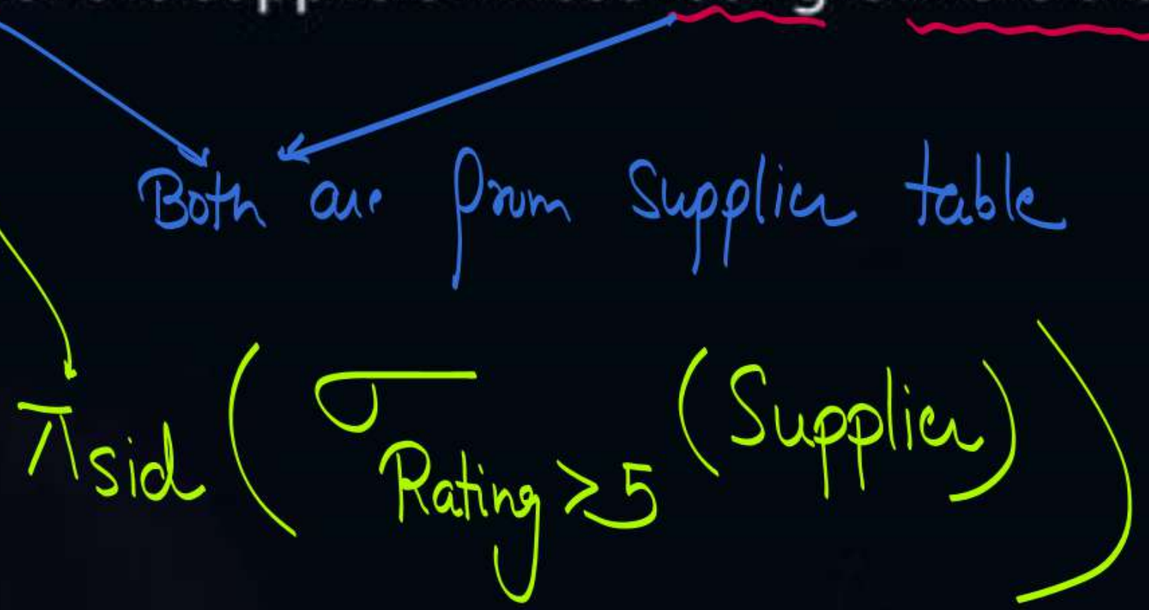
Q: Retrieve Sids of all Supplies

π_{sid} (Supplies)

Q: Retrieve Sids of Supplies who supplied some Parts

π_{sid} (Catalog)

#Q. Retrieve Sid of the suppliers whose rating is more than 5.



#Q. Retrieve Sid of the suppliers who have supplied some parts.

π_{sid} (Catalog)

π_{sid} (Supplier)
will be wrong

#Q. Retrieve Sid of the suppliers who have supplied some Red color parts.

Catalog (C)

Sid	Pid	Cost
S_1	P_1	20
S_1	P_2	30
S_2	P_2	30
S_3	P_2	20
S_3	P_3	10

Parts (P)

Pid	Pname	Color
P_1	ABC	Red
P_2	XYZ	Green
P_3	KBC	Red

$$\pi_{C.Sid}\left(\sigma_{C.Pid = P.Pid \,\wedge\, P.Color = \text{'Red'}}\left(C \times P\right)\right)$$

#Q. Retrieve Sid of the suppliers who have supplied some Red or some Green color parts.

#Q. Retrieve Sid of the suppliers who have supplied some Red and some Green color parts.

#Q. Retrieve Sid of the suppliers who have supplied all parts.

#Q. Retrieve Sid of the suppliers who have supplied all Red color parts.

#Q. Retrieve Sid of the suppliers who have supplied at least two parts.

#Q. Retrieve Sid of the suppliers who have supplied exactly one part.

#Q. Retrieve Sid of the suppliers who have supplied at most one part.

#Q. Retrieve Sid of the suppliers who have supplied at least three parts.

#Q. Retrieve Sid of the suppliers who have supplied most expensive parts.

2 mins Summary

Topic Division operation

Topic Practice questions

Slide

THANK - YOU