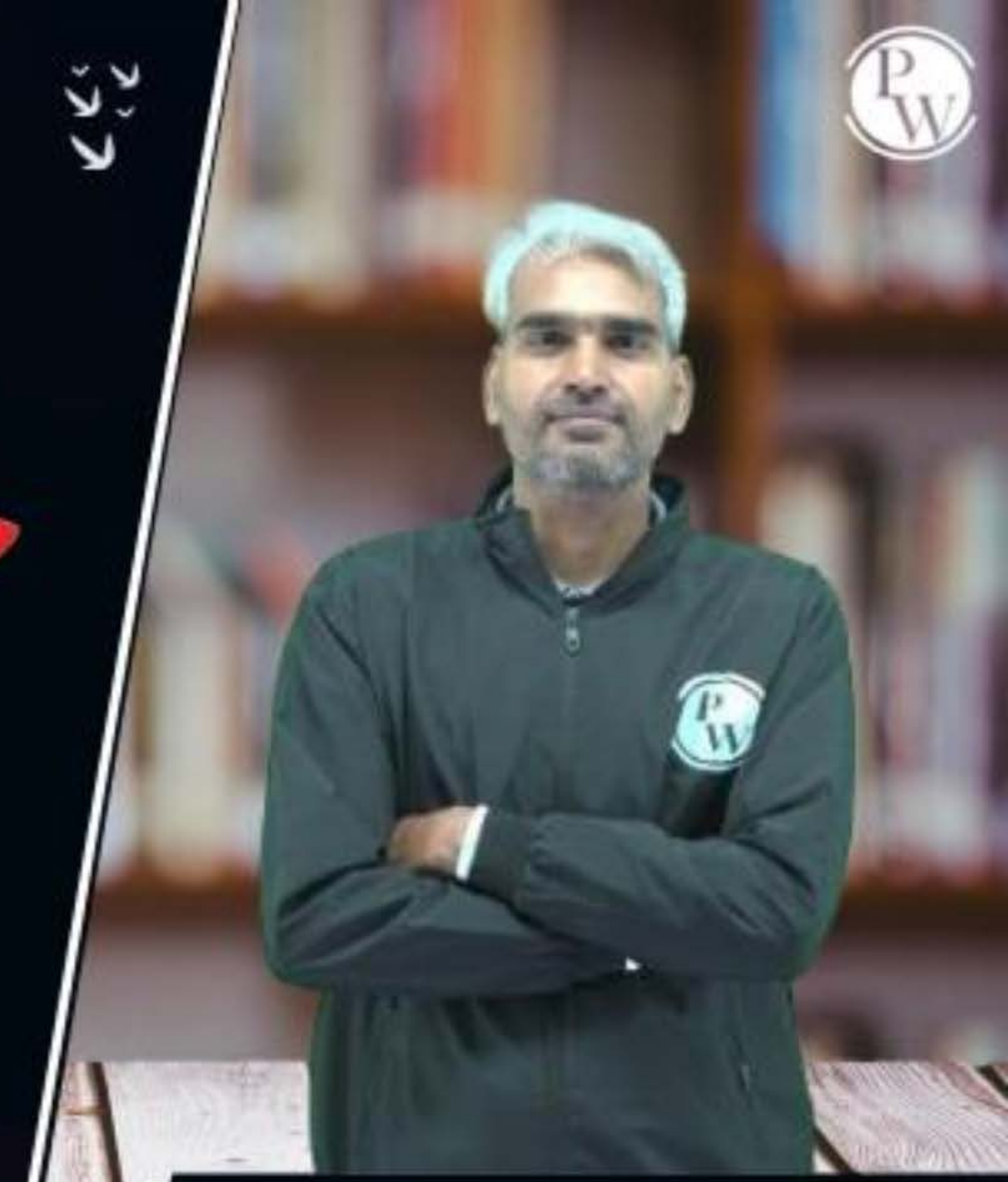
DS & AI

Database Management System

Super 1500+

Lecture No. 04



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Recap of Previous Lecture

- **Topic** Normal forms
- **Topic** Lossless join decomposition
- **Topic** Dependency preserving decomposition
- **Topic** Decomposition up to BCNF

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Topics to be Covered

Topic: Relational Algebra

Basic RA opn
1. Projection
2. Selection
3. Cross product
4. Union
5. Set difference
6. Rename

Derived R.A. opn
1. Intersection ($R \cap S = R - (R - S)$)
2. Natural Join
3. Division

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#Q.19 Consider the relation schema R(A, B, C) has the following tuples

A	B	C
1	2	3
1	2	4
3	2	1

How many tuples appear in the result of

$$\pi_{A,B}(R) \bowtie_{R.B < S.B} \rho_{S(A,B)}(\pi_{B,C}(R))$$

A	B
1	2
3	2

S

~~B~~ A	~~C~~ B
2	3
2	4
2	1

o/p

A	B	A	B
1	2	2	3
1	2	2	4
3	2	2	3
3	2	2	4

#Q.20 One of the following four expressions of relational algebra is not equivalent to the other three.

They are all based on the relations R(A,B) and S(B,C).

Identify the expression which is not equivalent to other three.

A $\pi_{A,B}(R \bowtie S) \Rightarrow \pi_{A,B}(\pi_{A,B,C}(\sigma_{R.B=S.B}(R \times S)))$

o/p is same

B $R \bowtie \pi_B(S) \Rightarrow \pi_{A,B}(\sigma_{R.B=S.B}(R \times \pi_B(S)))$

C $R \cap (\pi_A(R) \times \pi_B(S))$

D $\pi_{A,R.B}(R \times S)$

R

A	B
1	2
2	1
3	2

S

B	C
2	3
3	1
5	2

$\pi_A(R) \times \pi_B(S)$

#Q.21 Consider two relations R(A,B) and S(B,C), and following two queries Q1 and Q2.

Q1: $R \bowtie S = \pi_{A,B,C}\left(\sigma_{R.B=S.B}(R \times S)\right)$

Q2: $\sigma_{R.B=S.B}(R \times S)$

No projection ∴ 4 attributes in o/p. R.A, R.B, S.B, S.C.

Which of the following is true?

Q_1: $o/p_1 = \{ (1,2,3), (1,2,4) \}$

Q_2: $o/p_2 = \{ (1,2,2,3), (1,2,2,4) \}$

A. Q1 and Q2 produces the same result

B. Result produced by Q1 is always contained in the result produced by Q2

C. Result produced by Q2 is always contained in the result produced by Q1

D. Q1 and Q2 produces different result

there will be only one salary w.r.t. each "name" ∴ whether we perform tuple wise subtraction (or) name wise subtraction o/p will be same.

#Q.22 Given a relation EMP(name, salary) we want to find the names of the employees with greatest salary.

Consider the following two queries Q1 and Q2.

Q1: $\pi_{name}[EMP - (\pi_{E1.name,\, E1.Salary}(\sigma_{E1.Salary < E2.Salary}(\rho_{E1}(EMP) \times \rho_{E2}(EMP))))]$

Q2: $\pi_{name}(EMP) - \pi_{E1.name}(\sigma_{E1.Salary < E2.Salary}(\rho_{E1}(EMP) \times \rho_{E2}(EMP)))$

A. Q1 and Q2 produces the same result

B. Result produced by Q1 is always contained in the result produced by Q2

C. Result produced by Q2 is always contained in the result produced by Q1

D. Q1 and Q2 produces different result

#Q.23 Consider the following relation Enroll(Sid, Cid, marks)

We want to retrieve the Sids of the Students such that marks are maximum for those students in some tuples.

We write two different query to get the desired O/P

Q1 :- $\pi_{sid}\left[Enroll - \left(\pi_{E1.Sid,\,E1.Cid,\,E1.marks}\left(\sigma_{E1.marks < E2.marks}\left(\rho_{E1}(Enroll) \times \rho_{E2}(Enroll)\right)\right)\right)\right]$

Q2 :→ $\left[\pi_{Sid}(Enroll) - \pi_{E1.Sid}\left(\sigma_{E1.marks < E2.marks}\left(\rho_{E1}(Enroll) \times \rho_{E2}(Enroll)\right)\right)\right]$

(a) Both Q1 & Q2 always produces Correct O/P { Only Q1 will always produce correct O/P, Q2 may or may not }

(b) O/P produced by Q1 is Contained in O/p produce by Q2

(c) O/P produced by Q2 is Contained in O/P produced by Q1

(d) Q1 & Q2 always produce different O/P.

Q1:

Enroll

Sid	Cid	Marks
S1	C1	50
S1	C2	30
S2	C2	50
S2	C1	50
S3	C1	40

−

S1	C2	30
S3	C1	40

=

S1	C1	50
S2	C2	50
S2	C1	50

$\Downarrow$

π_{sid}

O/P

S1
S2

Q2 :-

Enroll

Sid	Cid	Marks
S1	C1	50
S1	C2	30
S2	C2	50
S2	C1	50
S3	C1	40

−

S1	C2	30
S3	C1	40

=

π_{sid}

S1
S2
S3

π_{sid}

o/p :-

S1
S3

=

S2

×

#Q.23 Consider the following relation Enroll (Sid, Cid, Marks) → if Sid alone is P.K. then Both Q1 & Q2 will always produce same o/p

We want to retrieve the Sids of the Students such that marks are maximum for those students in some tuples.

We write two different query to get the desired o/p

Q1 :- $\pi_{sid}\left[Enroll - \left(\pi_{E1.Sid, E1.Cid, E1.marks} \left(\sigma_{E1.marks < E2.marks} \left(\rho_{E1}(Enroll) \times \rho_{E2}(Enroll) \right) \right) \right) \right]$

Q2 : → $\left[\pi_{Sid}(Enroll) - \pi_{E1.Sid} \left(\sigma_{E1.marks < E2.marks} \left(\rho_{E1}(Enroll) \times \rho_{E2}(Enroll) \right) \right) \right]$

(a) Both Q1 & Q2 always Produces Correct O/p { Only Q1 will always Produce Correct O/p, Q2 may or may not }

(b) O/p produced by Q1 is Contained in O/p Produce by Q2

(c) O/p produced by Q2 is Contained in O/p produced by Q1

(d) Q1 & Q2 always Produce different O/p.

Consider the following two instances of relⁿ R and relⁿ S:

#Q.24

R

A	B	C	D
1	2	3	4
2	2	3	1
3	1	2	4
4	3	1	2
1	1	2	5
2	1	2	6
3	2	3	4
4	2	3	5
1	3	1	5
5	3	1	4
3	3	1	6

S

B	C	E
1	2	6
2	3	5
3	1	9

Consider two queries

Q1: $\pi_{A,C,B}(R) \div \pi_{B}(S) = 0$

Q2: $\pi_{A,B,C}(R) \div \pi_{C}(S) = 0$

Q3: $\pi_{A,B,C}(R) \div \pi_{B,C}(S) = 2$

o/p = {1, 3}

If number of tuples produced by Q1, Q2 and Q3 are X, Y and Z respectively, then

$X + Y + Z = 2$

$0 + 0 + 2 = 2$

① $\pi_{sid,pid}(Catalog) \div \pi_{pid}(Parts)$

② $\pi_{sid,cid}(Enroll) \div \pi_{cid}(Course)$

$\pi_{P,Q,R,S,T}(R) \div \pi_{S,T}(S)$

2 mins Summary

Topic Relational Algebra

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THANK - YOU

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