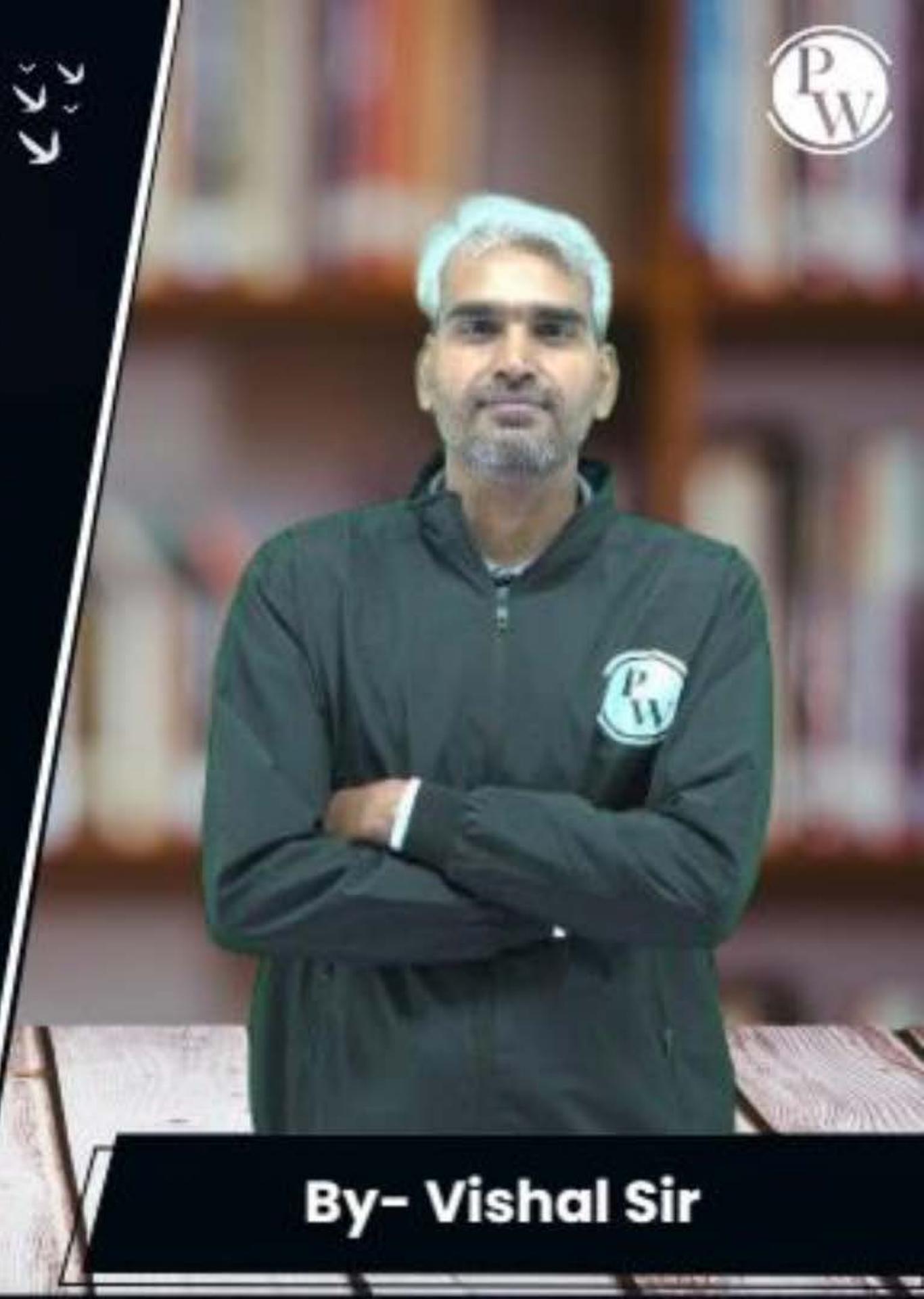


Computer Science & IT

Database Management System

Query Languages

Lecture No. 10



By- Vishal Sir

Recap

P
W



Topic

Practice questions

Topic

Tuple relational calculus (TRC)

Topics to be covered



Topic

Practice questions on TRC

Topic

Domain relational calculus (DRC)

#Q.

H.W.

Which of the following tuple relational calculus expression(s) is/are equivalent to $\forall t \in r(P(t))$?

- I $\neg \exists t \in r(\neg P(t))$
- II $\exists t \notin r(P(t))$
- III $\neg \exists t \in r(\neg P(t))$
- IV $\neg \exists t \notin r(\neg P(t))$

A. I only

B. II only

C. III only

D. III and IV only

$$\sim(\sim A) \equiv A$$

$$\sim \sim (\forall t \in r (P(t))) \equiv \exists t \in r (\sim P(t))$$

$$\sim(t \in R) \equiv t \notin R$$

$$\sim(\forall t \in R (P(t))) \equiv \exists t \in R (\sim P(t))$$

It will be true
when for tuples
of 'r' predicate
'P' is true

Not for all tuples = for at least one tuple
of 'r' predicate 'P' is true
of 'r' predicate 'P' is false

#Q.

Which of the following relational calculus expressions is not safe?

H.W

"MCQ"


AssignmentComparison

- ~~A. $\{t | \exists u \in R1 (t[A] = u[A]) \wedge \neg \exists s \in R2 (t[A] = s[A])\}$~~
- ~~B. $\{t | \forall u \in R1 (u[A] = "x" \Rightarrow \exists s \in R2 (t[A] = s[A] \wedge s[A] = u[A]))\}$~~
- C. $\{t | \neg(t \in R1)\}$
- ~~D. $\{t | \exists u \in R1 (t[A] = u[A]) \wedge \exists s \in R2 (t[A] = s[A])\}$~~

?

False — No need to check
True — then check

$t[A]$
 ∞

$$\begin{array}{l} P \rightarrow Q = T \\ F \rightarrow ? \end{array}$$

#Q.

H.W.

Consider the relation $\text{employee}(\text{name}, \text{sex}, \text{supervisorName})$ with name as the key. Supervisor Name gives the name of the supervisor of the employee under consideration. What does the following Tuple Relational Calculus query produce?

$$\{\text{e.name} \mid \text{employee}(\text{e})\}$$

$$\sim \sim (\forall x) [\neg \text{employee}(x) \vee x.\text{supervisorName} \neq \text{e.name} \vee x.\text{sex} = \text{"male"}]$$

$$\sim [\exists x (\text{employee}(x) \wedge x.\text{SupervisorName} = \text{e.name} \wedge \underline{x.\text{Sex} = \text{'female'}})]$$

- A. Names of employees with a male supervisor.

Not at least x in such one tuple Employee that

in that tuple X Employee Supervisor Name is some ω And Sex of Employee in tuple X is Female

- B. Names of employees with no immediate male subordinates

name of Employee in tuple 'e'

- C. Names of employees with no immediate female subordinates

- D. Names of employees with a female supervisor.

#Q.

H.W.

Consider The Following Relational Scheme

Student (school-id, sch-roll-no, sname, saddress)

School (school-id, sch-name, sch-address, sch-phone)

Enrolment (school-id, sch-roll-no, erollno, examname)

ExamResult (Erollno, examname, marks)

No. of students
who passed
the exam
in the school

{t | $\exists E \in \text{Enrolment } t = E.\text{school-id} \wedge$

| {x | $x \in \text{Enrolment} \wedge x.\text{school-id} = t \wedge (\exists B \in \text{ExamResult } B.erollno = x.erollno \wedge$

B.examname = x.examname $\wedge B.\text{marks} > 35$

{x | $x \in \text{Enrolment} \wedge x.\text{school-id} = t$ } * 100 > 35}

If a student needs to score more than 35 marks to
pass an exam what does the query return?

$$t = [\cdot . \text{school-id} \\ = 01]$$

E	School-id	Sch-roll-no.	Erollno.	examname
01	01	01	01	(Pass)
01	01	01	01	(Fail)
02	02	02	-	-
03	01	01	01	(Pass)
03	03	03	-	-

OP

Set of all tuples

toom a School, w.r.t. Students

who passed the exam

$$2 \div 3$$

$$66 \times 100 > 35$$

B₁

Enrolment

Examresult

Marks

Erollno. Examname

#Q.

- A. The empty set
- B. schools with more than 35% of its students enrolled in some exam or the other
- C. schools with a pass percentage above 35% over all exams taken together
- D. schools with a pass percentage above 35% over each exam

#Q.

H.W.

Consider a database that has the relation schemas
 EMP(Empld, EmpName, DeptId) and
 DEPT(DeptName, DeptId).

Note that the DeptId can be permitted to a NULL in the relation EMP. Consider
 the following queries on the database expressed in tuple relational calculus.

I. $\{t \mid \exists u \in \text{EMP} (t[\text{EMPName}] = u[\text{EmpName}] \wedge \forall v \in \text{DEPT} (t[\text{DeptId}] \neq \underline{\text{DeptId}}))\}$

II. $\{t \mid \exists u \in \text{EMP} (t[\text{EMPName}] = u[\text{EmpName}] \wedge \exists v \in \text{DEPT} (t[\text{DeptId}] \neq \underline{\text{DeptId}}))\}$

III. $\{t \mid \exists u \in \text{EMP} (t[\text{EMPName}] = u[\text{EmpName}] \wedge \exists v \in \text{DEPT} (t[\text{DeptId}] = \underline{\text{DeptId}}))\}$

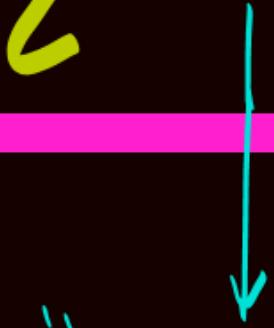
Which of the above queries are safe?

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

EMP		
Empld	EmpName	Dept-ID
E1	-	D1
E2	-	D2
E3	-	D
E4	-	NULL

Dept	
Dept-Name	Dept-ID
D1	
D2	
D3	

Domain Relational Calculus



“Column”



Topic : Syntax of DRC

TRC $\{ t \mid P(t) \}$

P
W

- Each query is an expression of the form $\{ \underbrace{<x_1, x_2, \dots, x_n>}_{\text{output domain variable}} \mid \underbrace{P(x_1, x_2, \dots, x_n)}_{\text{predicate formula}} \}$
- Where x_1, x_2, \dots, x_n represent output domain variables.
- $P(x_1, x_2, \dots, x_n)$ is the predicate formula.

In the output we will get the value from column x_1, x_2, \dots, x_n , for which predicate formula $P(x_1, x_2, \dots, x_n)$ is true

Consider the following relation

Emp (Eid, Ename, Salary)

Retriever all records of the Emp table

TRC { t | t \in Emp }

DRC : { < E, N, S > | < E, N, S > \in Emp }

it is the
Name assigned
to 1st Column
of Emp

it is the
Name assigned
to 2nd Column
of Emp

it is the
Name assigned
to 3rd Column
of Emp

Consider the following relation

Emp (Eid, Ename, Salary)

Retriever Ename of all Employee

TRC { t.Ename | t ∈ Emp }

DRC: { <N> | <E, N, S> ∈ Emp }

Consider the following relation

Emp (Eid, Fname, Salary)

Retriever Eid of all Employee

TRC { t.Eid | t ∈ Emp }

DRC: { <E> | <E,N,S> ∈ Emp }

#Q.

Consider the following relational schemas
Employee(Empld, EmpName, salary)

Select distinct EmpName from Employee table where salary > 2000

TRC: $\{ t.EmpName \mid t \in \text{Employee} \wedge t.\text{Salary} > 2000 \}$

DRC: $\{ \langle N \rangle \mid \langle E, N, S \rangle \in \text{Employee} \wedge \langle S \rangle > 2000 \}$

#Q.

Consider the following relational schemas
Student(Rollno, name, marks)

Select distinct name and marks of the student from Student table where
Rollno = 10

TRC : $\{t.name, t.marks \mid t \in \text{Student} \wedge t.Rollno = 10\}$

DRC : $\{ \langle N, M \rangle \mid \langle R, N, M \rangle \in \text{Student} \wedge \langle R \rangle = 10 \}$

$\{ \langle N, M \rangle \mid \langle 10, N, M \rangle \in \text{Student} \}$

#Q. Consider the following relational schema.

Students(rollno: integer, sname: string)

Courses(courseno: integer, cname: string)

Registration(rollno: integer, courseno: integer, percent: real)

Which of the following queries are equivalent to this query in English?

"Find the distinct names of all students who score more than 90% in the course numbered 107"

I. $\checkmark \text{SELECT DISTINCT S.sname FROM Students as S, Registration as R WHERE R.rollno=S.rollno AND R.courseno=107 AND R.percent > 90}$

II. $\Pi_{sname}(\sigma_{courseno=107 \wedge percent > 90} (\text{Registration} \bowtie \text{Students}))$

III. $\{T | \exists S \in \text{Students}, \exists R \in \text{Registration} (S.rollno=R.rollno \wedge R.courseno=107 \wedge R.percent > 90 \wedge T.sname=S.sname)\}$

IV. $\{< S_N > | \exists S_R \exists R_P (< S_R, S_N > \in \text{Students} \wedge < S_R, 107, R_P > \in \text{Registration} \wedge R_P > 90)\}$

~~A~~ I, II, III and IV

B. I, II and III only

C. I, II and IV only

D. II, III and IV only

$\langle R, N \rangle \in \text{Student} \wedge \langle R_N, 107, P \rangle \in \text{Registration} \wedge$
 $\langle R \rangle = \langle R_N \rangle \wedge \langle P \rangle > 90 \}$



2 mins Summary



- Topic** Practice questions on TRC
- Topic** Domain relational calculus (DRC)

THANK - YOU