ON delete CASCADE);

UNIT-II

Introduction to view :-

A view is a table whose are not explicity stored in the database.

Ex:- Find the name, student id of students whose got a Grade D in some courses, together with the (cid) (course id) for the course.

create a B-students (sname, sid, courses)

Query:- select s.name, sid, e.course

From student, Enrolled.E

where s.sid = e.sid and e.grade = "B";

output:-

sname	sid	course
Guider	53832	Reg203
Jones	53666	Hist105

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Relational algebra and calculus :- (formal query lang)

→ The DBMS we have to use two formal languages associated with relational model.

→ In defining relational algebra and calculus the alternative of referring to fields by position is more convinient than referring to fields by name.

Sailors (sid: integer, sname: string, rating: integer, age: real)

Boats (Bid: integer, bname: string, colour: string)

Reserves (Bid: integer, bid: integer, day: date)

Instance S_1 of sailors :-

Sid	Sname	rating	age
22	Dustin	7	45.0
31	lubber	8	55.5
58	Rusty	10	35.0

Instance S_2 of sailors :

Sid	Sname	rating	age
28	yuppy	9	35.0
31	lubber	8	35.5
44	grippy	5	35.0
58	Rusty	10	35.0

Instance R_1 of reserves :-

Sid	bid	day
22	101	10/12/96
58	103	11/12/96

(rows) columm

Selection (σ) and projection (π) :-

records (fields)

The relational algebra includes operators to select rows from a relation (σ) and to project collums (π).

These operations allow to manipulate data in single relation. For example: consider the instance of sailor relations as S2. We can retrieve rows corresponding to sailors by using selection operator.

Find the rating of sailor · S_2 the rating greater than 8.

$\sigma_{rating > 8} (S_2)$

sid	sname	rating	age
28	yuppy	9	35.0
58	Rusty	10	35.0

Find the name and rating of sailor (S_2)

$\pi_{sname, rating} (S_2)$

sname	rating
yuppy	9
lubber	8
grippy	5
Rusty	10

Find out only the age of sailor (S_2)

$\pi_{age} (S_2)$

Age
35.0
35.05
35.0
35.0

$\pi_{sname, rating}(\sigma_{rating > 8}(S_2))$

Name	rating
yuppy	9
Rusty	10

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Set operations :-

→ union ($\cup$) → $S_1 \cup S_2$ [all values]

intersection ($\cap$) → $S_1 \cap S_2$ [common]

set-difference ($-$) → $S_1 - S_2$ [remove common & write unique]

cross product → $S_1 \times R_1$

$S_1 \cup S_2$

sid	sname	rating	age
22	Dustin	7	45
31	lubber	8	35
58	Rusty	10	35
44	grippy	5	35
28	yuppy	9	35

$S_1 \cap S_2$

sid	name	rating	age
31	lubber	8	35
58	Rusty	10	35

$S_1 \times R_1$

22 × 22

22 × 58

31 × 22

31 × 58

58 × 22

58 × 22

$S_1 - S_2$

sid	name	rating	age
22	Dustin	7	45

Renaming operations :-

$\boxed{\rho\,(R(F)\,e)}$

ρ defines renaming operator / expression

R defines instance of relation

e defines relational algebra expression

F defines field names.

The field name defines which is a list of terms having a form from old name to new name.

ex:- The expression $\rho(C(1 \to sid_1, 5 \to sid_2), S_1 \times R_1)$

Joins :- (⋈)

Combining information from two or more relations and a Join can be defined as a cross product followed by selection and projection.

Condition joins:-

$\boxed{R \bowtie_c S = \sigma_c (R \times S)}$

The join operation accepts a join condition 'c' and a pair of relational instance as arguments and returns a relational "

→ The join condition is identical to a selectional condition in a form.

$S_1 \bowtie_{rating > 8} S_2$

→ The join defines to be a cross product followed by condition can refers to attribute of both relations.

Equi Joins:-

A common special case of join ~~condi'~~ operation or Joins is when the join condition consists soloely of equities of the form of given condition.

$S_1 \bowtie R_1$

$S.sid = R.sid$

$S.name = R.name$

Init these form of $S.sid = R.sid$ that is equilities between two fields in the two relations.

→ A Join conditions that contains only such equlities of the join operators is refining by doing an additional projection in which the given fields are dropped.

→ The join operation which this is refinement is called equi joins

$S_1 \bowtie_{S.sid = R.sid}$

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Division:-

A

SNO	PNO
S_1	P_1
S_1	P_2
S_1	P_3
S_1	P_4
S_2	P_1
S_2	P_2
S_3	P_2
S_4	P_2
S_4	P_4

B1

pno
P_2

B2

pno
P_2
P_4

B3

pno
P_1
P_2
P_4

A/B1

sno
S_1
S_2
S_3
S_4

A/B2

sno
S_1
S_4

A/B3

sno
S_4

two

consider the relation instance of A and B,

A has 'x, y' and B has 'y' fields. with same

sno pno / pno

domain of 'A'. The division operation A/B has a

set of all "x" values, such that for every y value

in B, there is a tuple in A.

A/B define,

$$\pi_x(A) - \pi_x((\pi_x(A) \times B) - A)$$

$$\pi_x(A) \times B_1$$

$$\pi_x((\pi_x(A \times B_1) - A)$$

$$\pi_x(A) - \pi_x[(\pi_x(A \times B_1) - A)$$

$\pi_x(A \times B_1)$		$\pi_x(A \times B_1) - A$
S1 P2		S1 P1
S2 P2	$- A =$	S1 P3
S3 P2		S1 P4
S4 P2		S2 P1
		S4 P4

S_3 of saliors:-

sid	sname	rating	age
22	Dustin	7	45.0
29	Brutus	1	33.0
31	lubber	8	55.0
32	Andy	8	25.0
58	Rusty	10	35.0
64	Horatio	7	35.0
71	Zorba	10	16.0
74	Haratio	9	35.0
85	Art	3	25.0
95	Bob	3	63.0

R_2 of Reserves:-

sid	bid	day
22	101	10/10/98
22	102	10/10/98
22	103	10/8/98
22	104	10/7/98
31	102	11/10/98
31	103	11/6/98
31	104	11/12/98
64	101	9/5/98
64	102	9/5/98
74	103	7/8/98

B_1 of Boats:-

bid	bname	color
101	interlake	blue
102	interlake	red
103	dipple	green
104	marine	red

Find the name of sailors who have reserved bid 103.

$\sigma_{bid = 103}$ Reservers

$\pi_{sname}((\sigma_{bid=103} \text{ Reserve}) \bowtie \text{Sailors})$

Find the name of sailors who have reserved red boat.

$(\sigma_{colour = Red} \text{ Boat})$

$\pi_{sname}((\sigma_{color = red} \text{ boat}) \bowtie \text{Reserve} \bowtie \text{Sailor})$

```
select   sname
From     Boat, Reserve, sailor
where    S.sid = R.sid, B.bid = B.bid,
         colour = red
```

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Find the name of sailors who have reserved atleast one boat

$\pi_{sname}(\text{sailors} \bowtie \text{Reserves})$

Find the name of sailors who have reserved a red colour boat or a green colour boat.

$\pi_{sname}((\sigma_{colour = Red} \text{ Boat}) \bowtie \text{Reserve} \bowtie \text{Sailors}) \cup$

$((\sigma_{colour = Green} \text{ Boat}) \bowtie \text{Reserve} \bowtie \text{Sailors})$

Relational calculus:-

domain = fields
tuples = records

→ Relational calculus is alternative of relational algebra and here agenda of procedural language represents relational algebra & non procedural language represents relational calculus.

→ The relational calculus had a big influence on the design of commercial query languages such as SQL and query by example (QBE)

→ Relational calculus made by tuple relational calculus or domain relational calculus.

→ The variable in tuple relational calculus (TRC) takes on tuples (or) records as value and TRC has more influence on SQL

→ The variable in DRC (Domain relational calculus) takes on range over field values and strongly influenced by QBE.

TRC:-

- A TRC the tuple variable is a variable that takes on tuples of a particular relation as values, i.e every value assigned to a given tuple variable has the same number of tuples & fields.

- TRC query has the form of

$$\{ T \mid P(T) \}$$

T = tuble variable

P(T) = A formula that denotes T.

For example:- Find all sailors with a rating above 7. (tuples will be displayed)

$$\{ S \mid S \in \text{sailors} \wedge S.\text{rating} > 7 \}$$

$\in$ = belongs

syntaxes of TBC :-

i) $R \in Rel$ (Rel be a relation name)

ii) $R.a \; op \; S.b$ (R and S be a tuple variables and a, b are attributes of variable)

op = operation

3) $\neg p, p \wedge q, p \vee q, p \Rightarrow q$

$\neg$ = reverse, $\wedge$ = and

4] $\exists R(P(R))$ R is tuple variable

$\exists$ = there exists

5) $\forall R(P(R))$

$\forall$ = for all

$\forall$ = to all fields

$\exists$ = to display only some fields

Find the name & age of sailors with the rating above 7.

$$\{ P \mid \exists S \in \text{sailors} \, (S.\text{rating} > 7 \wedge P.\text{name} = S.\text{name} \wedge P.\text{age} = S.\text{age}) \}$$

$\exists$ = not all fields only

exc name & age

Find the sailors name, boat id and reserve date for each reserve relation.

$\{ P / \exists S \in sailors, \exists R \in reserves (S.sid = R.sid \wedge$

P.name	P.bid	P.date

$P.name = S.name \wedge$

$P.bid = R.bid \wedge$

$P.date = R.date) \}$

Select name, id, date

From sailors, reserves

where S.sid = R.sid

Find the name of sailors who reserved boat 103.

$\{ P / \exists S \in sailors, \exists R \in Reserve (S.sid = R.sid \wedge$

$P.name = S.name \wedge$

$R.bid = 103) \}$

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Domain relational calculus (DRC):-

A Domain variable is a variable the range over values in the domain of some variables $\{ (x_1, x_2 ---- x_n) / P(x_1, x_2, x_3 --- x_n) \}$

Syntax :- 1. $< x_1 x_2 x_3 x_4 --- x_n > / \in Rel$

-create variable for every field

2. $X \ op \ Y$ (X, Y are domain variables)

3. $X op$ constant op X

4. $\neg p, p \wedge q, p \vee q, p \Rightarrow q$

5. $\exists X (p(X))$

6. $\forall X (p(x))$

1. Find all sailors with the above rating 7.

— all fields.

$$\{(I,N,R,A) \mid (I,N,R,A) \in sailors \wedge rating > 7\}$$

2. Find the name of sailors who have reserved boat 103.

$$\{N \mid \exists (I,R,A\ (I,N,R,A) \in Sailors \wedge \exists I_r, B_r, D\ (I_r, B_r, D) \in Reserve \wedge I_r = I \wedge B_r = 103\}$$

3. Find the name of sailors who have reserved red boat.

$$\{(N) \mid \exists I, R, A\ (I,N,R,A) \in sailors \wedge \exists I_r, B_r, D\ (I_r, B_r, D) \in Reserves \wedge) \exists I_B, N_B, C\ (I_B, N_B, C) \in Boat \wedge C = red \wedge I_r = I_r \wedge B_r = I_B\}$$