UNIT-02

Relational Algebra.

Two formal languages associated with relational data models are ① Relational Algebra

② Relational calculus.

Operators

① Selection (σ):- To select the rows or records or tuples of a table

Syntax: $\sigma_C(T/E)$. C → condition, T → table name / Expression

Ex:- Find the details of all sailors with rating above 7

$\sigma_{rating>7}(sailors)$

② projection (Π) → To select columns of a table

Syntax:- $\Pi_{C_1, C_2, C_3 \ldots C_n}(T/E)$ $C_1, C_2, \ldots C_n$ → Column, T → table name

Ex:- Find the sid, sname of sailors

$\Pi_{sid,sname}(sailors)$

③ Set operators:- $\cup, \cap, -$

$\cup$ → union

$\cap$ → intersection

$-$ → set difference

Ex:-

Division - It is used to find records in one relation that are associated with all records in another relation - It is commonly used when we want to identify entities that satisfy certain conditions across multiple related data sets.

R, S are two relations the division operator the division operators. $R \underset{(A \cap B)}{\div} S_{(B)}$ can be applied if

i) the attributes of S are proper subset of the attributes of R

result will include all attributes of R except those that are in S. It returns the tuples from R that are associated with every tuple in S

Ex:- Find the sailors who reserved all boats

$$\Pi_{sid,bid}(Reserves) \div \Pi_{bid}(Boats)$$

Find the sailors who reserve all red boats

$$\Pi_{sid,bid}(Reserves) \div \Pi_{bid}(\sigma_{bcolor='red'}(Boats))$$

Generalised projection

It extends the projection operations by allowing operations such as arithmatic and string functions to be used in the projection list.

Syntax

$$\Pi_{f_1(A), f_2(A), f_3(A) \ldots f_n(A)}(Table)$$

Ex:- Find the ~~independ~~ incremented ratings of all Sailors.

$$\Pi_{rating+1}(Sailors)$$

Compute the annual salaries of all employees

$$\Pi_{salary*12}(employee)$$

Aggregation operators

It means the use of aggregate functions

Syntax:-

$$G_{op(Att)}(T/E)$$

$$G_{G_1, G_2, G_3 \ldots op(Att)}(T/E)$$

This is to apply aggregate functions to different groups

Ex:-

① Find the no. of sailors.

$$\mathcal{G}_{\text{count}(s.id)} \{\text{Sailors}\}$$

② Find the avg age of sailors for each rating level

$$\text{rating}\ \mathcal{G}_{\text{avg(age)}}\ \text{Sailors}.$$

TRC [Tuple Relational calculus]

Syntax

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

T – A tuple variable

P(T) – Formula that describes a tuple variable

Ex:-

① Find all sailors with rating above 7

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

② Find the all details of sailors with age < 40

$$\{S \mid S \in \text{Sailors} \wedge S.\text{age} < 40\}$$

③ Find sid, sname of the sailors with rating > 7

$$\{P \mid \exists S \in \text{sailors} \wedge (S.\text{rating} > 7 \wedge P.\text{sid} = S.\text{sid} \wedge P.\text{sname} = S.\text{sname})\}$$

Ex:- (4) Find the sailor name, boat id, and reservation day with each reservation.

$\{P \mid \exists S \in Sailors\ \exists R \in Reserves\ (S.sid = R.sid \wedge P.sname = S.sname \wedge P.bid = R.bid \wedge P.day = R.day)\}$

Fin

(5) Find the names of sailors who have reserved boat 103

Gen

$\{P \mid \exists S \in Sailors.\ \exists R \in Reserves\ (S.sid = R.sid \wedge P.sname = S.sname \wedge bid = 103)\}$

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Ex:-

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