Database Systems 10127
Lab 5

Relational Algebra Exercise

Given the following relations

S (sid, sname, age)   this is a table of sailors
B (bid, bname, color)   this is a table of boats
R (sid, bid, date)   this is a table of reservations

Basic Operators:

▶ Unary (single relation) operators
  ▶ SELECT ($\sigma_{selection\text{-}condition}$)
  ▶ PROJECT ($\pi_{attribute\text{-}list}$)
  ▶ RENAME ($\rho_{new\text{-}name}$)

▶ Binary (two relation) operators
  ▶ UNION ($\cup$)
  ▶ SET DIFFERENCE (-)
  ▶ CARTESIAN PRODUCT (x)

Derived Operators:

  ▶ INTERSECTION ($\cap$)
  ▶ GENERAL JOIN($\bowtie_{condition}$)
  ▶ NATURAL JOIN ($\bowtie$)

Write relational algebra statements for each problem

0) Find the color of boat number 103

   π_{color} ($\sigma_{bid = 103}$ (B))

1) Find IDs of sailors who reserved boat number 103

π sid (σ bid = 103 (R))

2) Find all reservations of boat number 103

σ bid=103 (R)

3) Find names of sailors who reserved boat number 103

π sname (S $\bowtie$ (σ bid=103 (R)))

4) Find the IDs of boats reserved by Harry

π bid (R $\bowtie$ π sid((σ sname = "Harry" (S))))

5) Find the colors of boats reserved by Harry

π color {B $\bowtie$ [π bid (R $\bowtie$ π sid((σ sname = "Harry" (S))))]}

6) Find names of sailors who reserved a red boat

π sname (S $\bowtie$ { π sid (R $\bowtie$[π bid (σ color = red (B))])})

7) Find names of sailors who reserved a red **or** a green boat

π sname (S $\bowtie$ { π sid (R $\bowtie$[π bid (σ color = red OR green (B))])})

8) Find names of sailors who reserved a red **and** a green boat

Red_sids = π sid {R $\bowtie$[π bid (σ color = red (B))]}

Green_sids = π sid {R $\bowtie$[π bid (σ color = green (B))]}

π sname (S $\bowtie$ { Red_sids $\cap$ Green_sids })

9) Find IDs of sailors over age 20 who reserved a red boat

Red_sids = π sid {R $\bowtie$[π bid (σ color = red (B))]}

(π sid [σ age > 20 (S)]) $\cap$ Red_sids

10) Find IDs of sailors over age 20 who did not reserve a red boat

Red_sids = π sid {R $\bowtie$[π bid (σ color = red (B))]}

$(\pi_{sid} [\sigma_{age > 20} (S)]) - Red\_sids$

11) Find the IDs of the oldest sailors

$\pi_{sid} (S) - (\pi_{s1.sid} \{ \sigma_{s1.age < s2.age} [\rho_{s1} (S) \times \rho_{s2} (S)] \})$

12) Find the name and age of the oldest sailors

$O = \pi_{sid} (S) - (\pi_{s1.sid} \{ \sigma_{s1.age < s2.age} [\rho_{s1} (S) \times \rho_{s2} (S)] \})$

$\pi_{name, age} (O \bowtie S)$