CS386 Homework 2

Russell Miller
Oscar Sanabria

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Part 1

Write a relational algebra query that is equivalent to each of the following six SQL queries.

1. **SELECT DISTINCT agent_id FROM Agent;**
   $\pi_{agent\_id}(Agent)$

2. **SELECT agent_id FROM Agent;**
   $\pi_{agent\_id}(Agent)$

3. **SELECT DISTINCT meeting_frequency FROM Team;**
   $\pi_{meeting\_frequency}(Team)$

For questions 4 and 5, write the relational algebra expressions in two different ways.

4 **SELECT * FROM Agent A, SecurityClearance S WHERE A.clearance_id=S.sc_id AND A.country='USA' AND S.sc_id>4;**
$\sigma_{A.clearance\_id=S.sc\_id \wedge A.country='USA' \wedge S.sc\_id>4}(A \times S)$
$A \bowtie_{A.clearance\_id=S.sc\_id \wedge A.country='USA' \wedge S.sc\_id>4} S$

5 **SELECT DISTINCT AF.description, AR.affiliation_strength, A.last, A.salary FROM Agent A, AffiliationRel AR, Affiliation AF WHERE A.agent_id=AR.agent_id AND AR.aff_id=AF.aff_id;**
$\pi_{AF.description,AR.affiliation\_strength,A.last,A.salary}$
$(\sigma_{A.agent\_id=AR.agent\_id \wedge AR.aff\_id=AF.aff\_id}(A \times AR \times AF))$

$\pi_{AF.description,AR.affiliation\_strength,A.last,A.salary}(A \bowtie_{A.agent\_id=AR.agent\_id} AR \bowtie_{AR.aff\_id=AF.aff\_id} AF)$

Part 2

For each of the following relational algebra queries: write an equivalent SQL query, show the count of how many rows are returned in the query answer when you run your SQL query against the Spy database, and show (at most) five rows of your query answer when you run your SQL query against the Spy database.

1. $\pi_{agent.agent\_id,first,last}($
   $(teamrel \bowtie_{teamrel.team\_id=team.team\_id}(\sigma_{name='Jester'}team))$
   $\bowtie_{agent.agent\_id=teamrel.agent\_id}(agent))$

   SELECT $agent.agent\_id, first, last$ FROM $teamrel$ INNER JOIN $team$
   ON $teamrel.team\_id = team.team\_id$ AND $team.name =' Jester'$
   INNER JOIN $agent$ ON $agent.agent\_id = teamrel.agent\_id$;
   8 rows:

174	Travis	Balasubramanian
324	Ethan	Kokkelemberg
391	George	Riley
518	John	Lomeli
580	George	Jiammin

2. $\pi_{A.first,A.last}((skillrelSR2 \bowtie_{SR2.skill\_id=SR1.skill\_id}($
   $\sigma_{agent\_id=5}skillrelSR1)) \bowtie_{A.agent\_id=SR2.agent\_id}(agentA))$

   SELECT $A.first, A.last$ FROM $skillrelSR2$ INNER JOIN $skillrelSR1$
   ON $SR2.skill\_id = SR1.skill\_id$ INNER JOIN $agentA$ ON $A.agent\_id = SR2.agent\_id$
   WHERE $SR1.agent\_id = 5$;
   25 rows:

George	Fairley
Nickolas	Godfrey
Tom	Vengataraman
Alex	Brunner
Marie	McKinney

3. $\pi_{skill}(skill \bowtie_{skill.skill\_id=skillrel.skill\_id}($
   $skillrel \bowtie_{skillrel.agent\_id=agent.agent\_id}($
   $agent \bowtie_{agent.agent\_id=teamrel.agent\_id}($
   $teamrel \bowtie_{teamrel.team\_id=team.team\_id}($
   $team \bowtie_{team.team\_id=mission.team\_id}($
   $\sigma_{name='Black'}mission))))))$

   SELECT DISTINCT $skill$ FROM $skill$ INNER JOIN $skillrel$
   ON $skill.skill\_id = skillrel.skill\_id$ INNER JOIN $agent$
   ON $skillrel.agent\_id = agent.agent\_id$ INNER JOIN $teamrel$
   ON $agent.agent\_id = teamrel.agent\_id$ INNER JOIN $team$
   ON $teamrel.team\_id = team.team\_id$ INNER JOIN $mission$
   ON $team.team\_id = mission.team\_id$ AND $mission.name =' Black'$;
   19 rows:
   Foreign Linguist
   Speed Reader
   Radar Intelligence
   Blackbelt - Karate
   Medicine

Part 3

A. Write two SQL queries for each report below: one that uses JOIN and one that does not.

B. Write an equivalent relational algebra statement for one of the SQL statements in part A.

1. **A.** List the artist names that are in the R&B genre.

   ```
   SELECT artist FROM record_artists INNER JOIN product_music_extra
   ON record_artists.artists_id=product_music_extra.artists_id INNER JOIN music_genre
   ON product_music_extra.music_genre_id=music_genre.genre_id
   WHERE music_genre.music_genre_name='R&B';

   SELECT artist
   FROM record_artists,product_music_extra,music_genre
   WHERE record_artists.artists_id=product_music_extra.artists_id
   AND product_music_extra.music_genre_id=music_genre.genre_id
   AND music_genre.music_genre_name='R&B';
   ```

   B. $\pi_{artist}(record\_artists \bowtie_{record\_artists.artists\_id=product\_music\_extra.artists\_id}($
   $product\_music\_extra \bowtie_{product\_music\_extra.music\_genre\_id=music\_genre.genre\_id}($
   $\sigma_{music\_genre\_name='R\&B'} music\_genre)))$

2. **A.** List the products_ids that have the record company 'Acme Records'.

   ```
   SELECT products_id FROM product_music_extra INNER JOIN record_company
   ON product_music_extra.record_company_id=record_company.record_company_id
   WHERE record_company.record_company_name='Acme Records';

   SELECT products_id
   FROM product_music_extra,record_company
   WHERE product_music_extra.record_company_id=record_company.record_company_id
   AND record_company.record_company_name='Acme Records';
   ```

   B. $\pi_{products\_id}($ $product\_music\_extra \bowtie_{product\_music\_extra.record\_company\_id=}$
   $_{record\_company.record\_company\_id}($
   $\sigma_{record\_company.record\_company\_name='AcmeRecords'} record\_company))$

3. **A.** List the record_company_names that have artists in the R&B genre.

   ```
   SELECT record_company_name FROM record_company INNER JOIN product_music_extra
   ON record_company.record_company_id=product_music_extra.record_company_id
   INNER JOIN music_genre ON product_music_extra.music_genre_id=music_genre.music_genre_id
   WHERE music_genre.music_genre_name='R&B';

   SELECT record_company_name
   FROM record_company,product_music_extra,music_genre
   WHERE record_company.record_company_id=product_music_extra.record_company_id
   AND product_music_extra.music_genre_id=music_genre.music_genre_id
   AND music_genre.music_genre_name='R&B';
   ```

B. $\pi_{record\_company\_name}($
$record\_company \bowtie_{record\_company.record\_company\_id=product\_music\_extra.record\_company\_id}($
$product\_music\_extra \bowtie_{product\_music\_extra.music\_genre\_id=music\_genre.music\_genre\_id}($
$\sigma_{music\_genre.music\_genre\_name='R\&B'} music\_genre)))$

4. **A.** What are the record_company_urls that produce music in the 'Rock' genre

```
SELECT record_company_url FROM record_company_info
INNER JOIN product_music_extra
ON record_company.record_company_id=product_music_extra.record_company_id
INNER JOIN music_genre
ON product_music_extra.music_genre_id=music_genre.music_genre_id
WHERE music_genre.music_genre_name='Rock';

SELECT record_company_url
FROM record_company_info,product_music_extra,
WHERE record_company_info.record_company_id = product_music_extra.record_company_id
AND product_music_extra.music_genre_id = music_genre.music_genre_id
AND music_genre_name = 'Rock';
```

B. $\pi_{record\_company\_url}($
$record\_company\_info \bowtie_{record\_company.record\_company\_id=product\_music\_extra.record\_company\_id}($
$product\_music\_extra \bowtie_{product\_music\_extra.music\_genre\_id=music\_genre.music\_genre\_id}($
$\sigma_{music\_genre.music\_genre\_name='Rock'} music\_genre)))$