CS 586 Introduction to Databases
Assignment 5 – Constraints, Embedded SQL
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Part I Checking Constraints
Question 1: Give a query to check whether {first, last} is a key for the Agent table.
Method 1
SELECT first, last FROM spy.agent;
662 row(s)

SELECT count(*), first, last FROM spy.agent
group by first, last
;
659 row(s)
Answer: The constraint is not satisfied. The spy.agent has 662 rows in total. After we group the table by
its first and last name, the duplicate names show up. And the total row number reduces to 659. Since there
are people who have the same first and last name, {first, last} cannot be a key for the Agent table.
Method 2
SELECT a.agent_id, a.first, a.last
FROM agent a, agent b
WHERE a.first = b.first
AND a.last = b.last
AND a.agent_id != b.agent_id
;
6 row(s)
Answer: There are 6 people in total who have same names. So {first, last} cannot be a key for the Agent
table.

Question 2 (10 points): Give a query to check whether title is a key for the Affiliation table.
Method 1
SELECT title FROM spy.affiliation;
34 row(s)

SELECT count(*), title FROM spy.affiliation
group by title
;
34 row(s)
Answer: The constraint is satisfied. There are no duplicates in title column. The spy. affiliation has 34
rows in total. After we group the table by title, it still returns 34 rows. As a result, title can be a key for
Affiliation table.

Method 2
SELECT *
FROM affiliation a, affiliation b
WHERE a.title = b.title
AND a.aff_id != b.aff_id
;
No rows found.
Answer: Title can be a key for Affiliation table because title values are unique in the table.

Question 3 (10 points): Give a query to check whether Agent.agent_id is a foreign key to Teamrel.agent_id.
SELECT * FROM spy.teamrel
where spy.teamrel.agent_id NOT IN
(SELECT spy.agent.agent_id FROM spy.agent);

No rows found.

Answer: The constraint is satisfied. Teamrel.agent_id matches all the value (Agent.agent_id) in the referenced table. So Agent.agent_id is a foreign key to Teamrel.agent_id.

Question 4 (10 points): Give a query to check whether Skill.skill_id is a foreign key to Skillrel.skill_id.
SELECT * FROM spy.Skillrel
where spy.Skillrel.skill_id NOT IN
(SELECT spy.Skill.skill_id FROM spy.Skill);

No rows found.

Answer: The constraint is satisfied. Skillrel.skill_id matches all the value (Skill.skill_id) in the referenced table. So Skill.skill_id is a foreign key to Skillrel.skill_id.

Question 5 (10 points): Give a query to check that no agent has at more than three skills.
SELECT a.agent_id, count(s.skill)
FROM agent a, skillrel sr, skill s
WHERE a.agent_id = sr.agent_id
AND sr.skill_id = s.skill_id
GROUP BY a.agent_id
HAVING count(s.skill) > 3
ORDER BY a.agent_id
;
250 row(s)
Answer: The constraint is not satisfied. There are 250 agents who have more than three skills.

Question 6 (10 points): Give a query to check whether every agent speaks at least two languages.
Method 1
SELECT count(agent_id) FROM spy.agent;

count
662

1 row(s)

SELECT a.agent_id, count(l.language)
FROM agent a, languagerel lr, language l
WHERE a.agent_id = lr.agent_id
AND lr.lang_id = l.lang_id
GROUP BY a.agent_id
HAVING count(l.language) >= 2
ORDER BY a.agent_id
;
541 row(s)
Answer: The constraint is not satisfied. Not every agent speaks at least two languages. There are 662 agents in total, but only 541 agents speak at least two language.
Method 2
SELECT a.agent_id, count(l.language)
FROM agent a, languagerel lr, language l
WHERE a.agent_id = lr.agent_id
AND lr.lang_id = l.lang_id
GROUP BY a.agent_id
HAVING count(l.language) < 2
ORDER BY a.agent_id
;
121 row(s)
Answer: There are 121 people who only speak one language.

Question 7 (10 points): Give a query that checks that every team has at least three skills represented.
Method 1
SELECT count(team_id) FROM spy.team;

count
42

1 row(s)

SELECT t.team_id, count(distinct s.skill)
FROM team t, teamrel tr, agent a, skillrel sr, skill s
WHERE t.team_id = tr.team_id
AND tr.agent_id = a.agent_id
AND a.agent_id = sr.agent_id

AND sr.skill_id = s.skill_id
GROUP BY t.team_id
HAVING count(distinct s.skill) >= 3
ORDER BY t.team_id
;
41 row(s)
Answer: The constraint is not satisfied. Not every team has at least three skills represented. There are 42 teams in total, but only 41 teams have at least three skills represented.
Method 2
SELECT t.team_id, count(distinct s.skill)
FROM team t, teamrel tr, agent a, skillrel sr, skill s
WHERE t.team_id = tr.team_id
AND tr.agent_id = a.agent_id
AND a.agent_id = sr.agent_id
AND sr.skill_id = s.skill_id
GROUP BY t.team_id
HAVING count(distinct s.skill) < 3
ORDER BY t.team_id
;
1 row(s)
Answer: There is one agent who has less than three skills.

Question 8 (10 points): Give a query that checks whether the minimum salary in each country is at least 40% of the maximum salary for that country.
Method 1
SELECT count(distinct country)FROM spy.agent;

count
22

1 row(s)
SELECT country, min(salary), max(salary), 0.4*max(salary) as FoutyPercent
FROM agent
GROUP BY country
HAVING min(salary) >= 0.4*max(salary)
ORDER BY country
;
20 row(s)
Answer: The constraint is not satisfied. Not every country has the property that the minimum salary in the country is at least 40% of the maximum salary for that country. There are 22 countries in total, but only 20 countries have the property that the minimum salary in the country is at least 40% of the maximum salary for that country.
Method 2
SELECT country, min(salary), max(salary), 0.4*max(salary) as FoutyPercent
FROM agent
GROUP BY country

HAVING min(salary) < 0.4*max(salary)
ORDER BY country
;
2 row(s)
Answer: There are two countries have the property that the minimum salary in the country is less than 40% of the maximum salary for that country.