

Assignment 2: Relational algebra & SQL

Answer

1 Relational algebra

- a. $\Pi_{\text{person-name}} (\sigma_{\text{company-name} = \text{"First Bank Corporation"}} (works))$
- b. $\Pi_{\text{person-name, city}} (employee \bowtie (\sigma_{\text{company-name} = \text{"First Bank Corporation"}} (works)))$
- c. $\Pi_{\text{person-name, street, city}} (\sigma_{(\text{company-name} = \text{"First Bank Corporation"} \wedge \text{salary} > 10000)} works \bowtie employee)$
- d. $\Pi_{\text{person-name}} (employee \bowtie works \bowtie company)$
- e. $\Pi_{\text{person-name}} ((employee \bowtie manages) \bowtie (\text{manager-name} = \text{employee2.person-name} \wedge \text{employee.street} = \text{employee2.street} \wedge \text{employee.city} = \text{employee2.city})) (\rho(\text{employee2}, employee))$
- f. The following solutions assume that all people work for exactly one company.
 $\Pi_{\text{person-name}} (\sigma_{\text{company-name} \neq \text{"First Bank Corporation"}} (works))$
 If people may not work for any company:
 $\Pi_{\text{person-name}} (employee) - \Pi_{\text{person-name}} (\sigma_{\text{company-name} = \text{"First Bank Corporation"}} (works))$
- g. $\Pi_{\text{person-name}} (works) - (\Pi_{\text{works.person-name}} (works \bowtie (\text{works.salary} \leq \text{works2.salary} \wedge \text{works2.company-name} = \text{"Small Bank Corporation"})) \rho(works2, works))$
- h. Note: Small Bank Corporation will be included in each answer.
 $\Pi_{\text{company-name}} (company / (\Pi_{\text{city}} (\sigma_{\text{company-name} = \text{"Small Bank Corporation"}} (company))))$
- i. $\rho(Tuple(1 \rightarrow p1, 2 \rightarrow c1, 4 \rightarrow p2, 5 \rightarrow c2, 7 \rightarrow p3, 8 \rightarrow c3), works \times works \times works)$
 $\Pi_{p1} \sigma_{(p1=p2)(p2=p3)(c1 \neq c2) (c1 \neq c3) (c2 \neq c3)} Tuple$

2 SQL

- a. select distinct [planet's name] from timetable where [character's name]='Princess Leia' and movie=3

SimpleQuery
planet's name
Endor
Tatooine

- b. (a1) select count(*) from timetable, characters where movie=3 and [planet's name]='Dagobah' and timetable.[Character's Name]=characters.[Name] and characters.[Race]='Human'

SimpleQuery
Expr1000
1

- (a2) select count(*) from timetable where movie=3 and [planet's name]='Dagobah'

SimpleQuery
Expr1000
3

- c. select distinct c.name from characters c, timetable t where c.name=t.[character's name] and t.[planet's name]=c.homeworld and movie=1

NONE

- d. select name from characters c where not exists (select p.name from planets p where affiliation='rebels' and p.name not in (select [planet's name] from timetable t where t.[character's name]=c.name and t.[planet's name]=p.name))

NONE

- e. select distinct t.[planet's name] from characters c, timetable t where c.name=t.[character's name] and c.race='droid'

SimpleQuery
planet's name
Bespin
Dagobah
Endor
Hoth
Tatooine

- f. select c.name, p.name, sum (t.[time of departure]-t.[time of arrival]+1) as amount from characters c, timetable t, planets p where t.[character's name]=c.name and t.[planet's name]=p.name and p.affiliation='neutral' group by c.name, p.name

SimpleQuery		
c.name	p.name	amount
C-3 PO	Bespin	5
C-3 PO	Tatooine	6
Chewbacca	Bespin	5
Chewbacca	Endor	6
Chewbacca	Tatooine	6
Darth Vader	Bespin	6
Han Solo	Bespin	5
Han Solo	Endor	6
Han Solo	Tatooine	6
Jabba the Hutt	Tatooine	25

SimpleQuery		
c.name	p.name	amount
Lando Calrissian	Bespin	10
Lando Calrissian	Endor	2
Lando Calrissian	Tatooine	3
Luke Skywalker	Bespin	3
Luke Skywalker	Dagobah	7
Luke Skywalker	Endor	4
Luke Skywalker	Tatooine	5
Obi-Wan Kanobi	Tatooine	3
Owen Lars	Tatooine	2
Princess Leia	Bespin	5
Princess Leia	Endor	6
Princess Leia	Tatooine	3
R2-D2	Bespin	3
R2-D2	Dagobah	7
R2-D2	Endor	4
Rancor	Tatooine	26
Yoda	Dagobah	28

- g. `select t.movie, c.name from characters c, timetable t, planets p where ((c.race='Human' and p.type='desert') or (c.race='Droid' and p.type='swamp')) and c.name=t.[character's name] and p.name=t.[planet's name] order by t.movie, c.name`

SimpleQuery	
movie	name
1	Han Solo
1	Luke Skywalker
1	Obi-Wan Kanobi
1	Owen Lars
2	R2-D2
3	Han Solo
3	Lando Calrissian
3	Luke Skywalker
3	Princess Leia

SimpleQuery	
movie	name
3	R2-D2

- h. `select distinct movie, [character's name] from timetable t1 where not exists (select * from timetable t2 where t1.movie=t2.movie and (select count([planet's name]) from timetable where t1.[character's name] = [character's name] and movie = t1.movie) < (select count([planet's name]) from timetable where t2.[character's name] = [character's name] and movie = t2.movie))`

SimpleQuery	
movie	character's name
1	Luke Skywalker
2	Luke Skywalker
2	R2-D2
3	Luke Skywalker

- i. `select distinct movie, [planet's name] from timetable t1 where not exists (select * from timetable t2 where t1.movie=t2.movie and (select count([character's name]) from timetable where t1.[planet's name] = [planet's name] and movie=t1.movie) < (select count([character's name]) from timetable where t2.[planet's name] = [planet's name] and movie=t2.movie))`

SimpleQuery	
movie	planet's name
1	Tatooine
2	Bespin
3	Tatooine

- j. `select distinct c1.race, t1.movie, t1.[character's name] from timetable t1, characters c1 where t1.[character's name]=c1.name and not exists (select * from characters c2, timetable t2 where t1.movie=t2.movie and c1.race=c2.race and (select sum([Time of Departure]-[Time of Arrival]+1) from timetable, characters where [character's name]=name and t1.[character's name] = [character's name] and race=c1.race and movie=t1.movie) < (select sum([Time of Departure]-[Time of Arrival]+1) from timetable, characters where [character's name]=name and t2.[character's name] = [character's name] and race=c2.race and movie=t2.movie))`

SimpleQuery		
race	movie	character's name
Droid	1	C-3 PO
Droid	2	R2-D2
Droid	3	R2-D2
Human	1	Darth Vader

SimpleQuery		
race	movie	character's name
Human	2	Luke Skywalker
Human	3	Luke Skywalker
Hutt	1	Jabba the Hutt
Hutt	2	Jabba the Hutt
Hutt	3	Jabba the Hutt
Rancor	1	Rancor
Rancor	2	Rancor
Rancor	3	Rancor
Unknown	1	Yoda
Unknown	2	Yoda
Unknown	3	Yoda
Wookie	1	Chewbacca
Wookie	2	Chewbacca
Wookie	3	Chewbacca

- k. select name from planets where name not in (select [planet's name] from timetable where movie=1 or movie=2)

SimpleQuery
Name
Endor
Kashyyyk
Corellia
Alderaan