CS 631  
RA_RC_SQL_HWK (Answers)

1. Get project names for projects supplied by supplier S1.
2. Get colors of parts supplied by supplier S1.
3. Get part numbers for parts supplied to any projects in London.
4. Get supplier numbers for suppliers with a status lower than supplier S1.
5. Get project numbers for projects not supplied with any red part by any London suppliers.
6. Get project numbers for projects supplied entirely by supplier S2.
7. Get part numbers for parts supplied to all projects in London.
8. Get supplier numbers for suppliers who supply the same part to all projects.
9. Get project numbers for projects supplied with at least all parts available from supplier S1.
10. Get part numbers for parts that are supplied either by a London supplier or to a London project.

Query #1

\[
\text{RA)}
\]

\[
\text{S1} \leftarrow \pi_{s# = 'S1'}(SPJ)
\]

RESULT \leftarrow \pi_{\text{JNAME}} (J \ast S1)

RC)

\{ X.JNAME \mid J(X) \text{ AND } \exists(W)(SPJ(W) \text{ AND } X.J# = W.J# \text{ AND } W.S# = 'S1') \}

SQL)

SQL> select j.jname
2   from j, spj
3   where spj.s#= 'S1' and spj.j#=j.j#;

JNAME
--------
Sorter
Console
Query #2

RA)

\[ S_1 \leftarrow \pi_{p\#} (\sigma_{s\# = 'S1'}(SPJ)) \]

RESULT \leftarrow \pi_{COLOR} (P \ast S_1)

RC)

\{ X.COLOR \mid P(X) \text{ AND } \exists(W)(SPJ(W) \\
AND X.J\# = W.J\# \\
AND W.S\# = 'S1') \}

SQL)

SQL> select distinct p.color 
2  from p, spj 
3  where spj.s\#='S1' and spj.p\#=p.p\#;

COLOR
-----
Red

Query #3

RA)

\[ L_J \leftarrow \pi_{j\#} (\sigma_{\text{CITY} = 'LONDON'}(J)) \]

LJ_PARTS \leftarrow \pi_{p\#}(SPJ \ast L_J)

RC)

\{ W.P\# \mid SPJ(W) \text{ AND } \exists(X)(J(X) \\
AND X.P\# = W.P\# \\
AND X.CITY = 'LONDON') \}

SQL)

SQL> select distinct spj.p\# as P\# 
2  from j, spj 
3  where j.city='London' and spj.j\#=j.j\#;

P\#
---
P3
P5
P6
Query #4

RA)

\[ S1\_STATUS \leftarrow \pi_{\text{STATUS}}(\sigma_{s\# = 'S1'}(S)) \]

RESULT \leftarrow \pi_{s\#}(\sigma_{\text{STATUS} < S1\_status}(S1\_STATUS))

RC)

\{ X.s\# \mid S(X) \text{ AND } \exists(Y)(S(Y) \\
\quad \text{ AND } Y.s\# = 'S1' \\
\quad \text{ AND } X.\text{STATUS} < Y.\text{STATUS} \\
\quad \text{ AND } X.s\# = Y.s\# ) \ }

SQL)

SQL> select s.s\# as S\# 
\quad from s 
\quad where s.status < (select s1.status 
\quad from s s1 
\quad where s1.s\# = 'S1');

S\#
---
S2

Query #5

RA)

\[ \text{NON\_RED\_INFO} \leftarrow \sigma_{\text{COLOR} \neq 'Red'}(P) \]

\[ \text{PROJ\_INFO} \leftarrow (\text{NON\_RED\_INFO} \bowtie_{P\# = P\#} \text{SPJ}) \]

RESULT \leftarrow \pi_{J\#}(\text{PROJ\_INFO})

RC)

\{ t.J\# \mid J(t) \text{ AND } \neg(\exists p)(P(p)) \\
\quad \text{ AND } (\exists s)(\text{SPJ}(s) \text{ AND } s.P\# = p.P\#) \}

SQL)

SQL> 1 select distinct spj.j\# as J\# 
\quad from spj 
\quad where not exists 
\quad (select * 
\quad from p, s 
\quad where p.color = 'Red' and s.city = 'London' 
\quad and spj.p\# = p.p\# and spj.s\# = s.s\#);
Query #6

RA)

PROJECTS_SUPPLIED_BY_S2 ← \( \pi_{P\#}(\sigma_{S\# = 'S2'}(SPJ)) \)

PROJECTS_NOT_SUPPLIED_BY_S2 ← \( \pi_{P\#}(\sigma_{S\# < 'S2'}(SPJ)) \)

RESULT ← \( \pi_{P\#}( PROJECTS_SUPPLIED_BY_S2 - PROJECTS_NOT_SUPPLIED_BY_S2 ) \)

RC)

\{ W.P\# \mid SPJ(W) \land \forall(X)(SPJ(X) \\
\quad \land X.S\# = 'S2' \\
\quad \land W.P\# = X.P\#) \\
\quad \land \neg \forall(Y)(SPJ(Y) \\
\quad \land Y.S\# < 'S2' \\
\quad \land W.P\# = Y.P\#) \}

SQL)

SQL> Select t1.j#
    2   from spj t1
    3   where t1.s#='S2'
    4   minus
    5   select t2.j#
    6   from spj t2
    7   where t2.s#!='S2';
Query #7: Division Operation

RA)

LONDON_PROJ_INFO(Proj) ← \( \pi_{J_#}(\sigma_{\text{CITY}='London'}(J)) \)

ALL_PROJ_INFO(Proj, Part) ← \( \pi_{J#,P_#}(\text{SPJ}) \)

RESULT_PART_INFO← (ALL_PROJ_INFO \( \div \) LONDON_PROJ_INFO)

RESULT ← \( \pi_{P_#} (\text{RESULT}_{\text{PART_INFO}} \times P) \)

RC)

\{ t.P_# | P(t) AND (\( \exists j \)) (J(j) AND j.\text{CITY}='London') AND (\( \exists a \)) (\text{SPJ AND a.J_#}=j.J_#) \}

SQL)

SQL> 1  Select p_# from P
2   where not exists(select * from j
3     where city='London'
4   and not exists (select * from spj
5     * where spj.p_#=p.p_# and spj.j_#=j.j_#))

P_#
---
P3
P5

Query #8: Another Division Operation (Try it yourself)

SQL> 1  select s_# from s
2   where exists (select *
3     from p
4   where not exists
5   (select * from j
6     where not exists (select * from spj
7     * where spj.j_#=j.j_# and spj.p_#=p.p_#
8     * and spj.s_#=s.s_#))))

S_#
---
S2

Query #9

RA)

PARTS_FROM_S1← \( \pi_{P_#}(\sigma_{S_#='S1'}(\text{SPJ})) \)

RESULT← \( \pi_{J_#}(\text{PARTS_FROM_S1} \times \text{SPJ}) \)
{ W.J# | SPJ(W) AND ∀(X)(SPJ(X) AND X.S# = ‘S1’ AND W.P# = X.P# ) }

SQL>
1  select j#
2  from spj
3  where exists (select *
4  from s
5  where s.s#='S1' and s.s#=spj.s#)
J#
---
J1
J4

Query #10

RA)
L_S ← π_s (∑ CITY = 'LONDON' (S))
L_J ← π_j (∑ CITY = 'LONDON' (J))
L_S_P ← π_p (L_S * SPJ)
L_J_P ← π_p (L_J * SPJ)
RESULT ← π_p (L_S_P ∪ L_J_P)

RC)
{ W.P# | SPJ(W) AND ∃(X)(S(X)
AND X.CITY = ‘LONDON’
AND W.S# = X.S#)
OR
∃(Y)(J(Y)
AND Y.CITY = ‘LONDON’
AND W.J# = Y.J# ) }

SQL>
1  select spj.p# as p#
2  from s, spj
3  where s.city='London' and spj.s#=s.s#
4  union
5  select t.p#
6  from spj t, j
7  where j.city='London' and t.j#=j.j#
P#
---
P1
P3
P5
P6