Section 4 – Relational Algebra
CSE 414

Question 1
Consider the following database schema:
Neighbors(name1, name2, duration)
Colleagues(name1, name2, duration)

Write a Relational Algebra Plan for the SQL query:

SELECT DISTINCT C1.name1, C2.name2
FROM Colleagues C1, Neighbors N, Colleagues C2
WHERE C1.name2 = N.name1
AND N.name2 = C2.name1
AND C1.duration < 10
AND C2.duration < 10
AND N.duration > 100

Question 2
Consider the following database schema:
R(A, B)
S(C, D, E)
T(F, H, G)

Write a Relational Algebra Plan for the SQL query:

SELECT R.B, S.E, SUM(T.G) AS sumG
FROM R, S, T
WHERE R.A = S.C
AND S.D = T.F
AND T.H > 55
GROUP BY R.B, S.E
Question 3

Consider the following database schema:

*Users*(uid, name)*

*Comment*(uid, pid, score, txt)*

*Picture*(pid, uid, img)*

**Part a**

Write a Relational Algebra Plan for the SQL query:

\[
\begin{align*}
\text{SELECT DISTINCT } & U.\text{uid} \\
\text{FROM Users } & U, \text{ Picture } P, \text{ Comment } C \\
\text{WHERE } & U.\text{uid} = P.\text{uid} \\
\text{AND } & P.\text{pid} = C.\text{pid} \\
\text{AND } & C.\text{score} > 8 \\
\text{GROUP BY } & U.\text{uid}, P.\text{pid} \\
\text{HAVING COUNT(*)} & > 10
\end{align*}
\]

**Part b**

Write a Relational Algebra Plan for the SQL query:

\[
\begin{align*}
\text{SELECT } & P.\text{pid} \\
\text{FROM Picture } & P \\
\text{WHERE NOT EXISTS} & \begin{align*}
& (\text{SELECT *} \\
& \quad \text{FROM Comment } C \\
& \quad \text{WHERE } P.\text{pid} = C.\text{pid} \\
& \quad \text{AND } C.\text{score} < 5)
\end{align*}
\end{align*}
\]

**Part c**

Write an equivalent SQL query. Bonus: do it without using a subquery!

\[
\begin{align*}
\Pi_{uid} & \\
\sigma_{s>20} & \\
\gamma_{U.\text{uid}, SUM(cnt)\rightarrow s} & \\
\rho_{U.\text{uid}=C.\text{uid}} & \\
\gamma_{C.\text{uid}, COUNT(*)\rightarrow cnt} & \\
\sigma_{C.\text{score} < 3} & \\
\text{Users } U \\
\text{Comment } C
\end{align*}
\]