Section 4 – Relational Algebra

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:

```sql
SELECT DISTINCT U.uid
FROM Users U, Picture P, Comment C
WHERE U.uid = P.uid
AND P.pid = C.pid
AND C.score > 8
GROUP BY U.uid, P.pid
HAVING COUNT(*) > 10
```

Part b
Write a Relational Algebra Plan for the SQL query:

```sql
SELECT P.pid
FROM Picture P
WHERE NOT EXISTS
  (SELECT *
   FROM Comment C
   WHERE P.pid = C.pid
   AND C.score < 5)
```

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

```
\[ \Pi_{uid} \sigma_{s>20} \left( \gamma_{U.uid, SUM(score)\rightarrow s} \left( U \sigma_{U.uid=C.uid} \gamma_{C.uid, COUNT(*)\rightarrow cnt} \left( \sigma_{C.score<3} \right) \right) \right) \]
```