Section 5 – RC & Datalog
CSE 344

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

Write datalog query that returns all neighbors who do not have any colleagues in common:
NonAnswers(n1, n2) :- Neighbors(n1, n2, -), Colleagues(n1, c, -), Colleagues(n2, c, -)
A(n1, n2) :- Neighbors(n1, n2, -), NOT NonAnswers(n1, n2)

Question 2
Relational Calculus Queries – same schema as above –

Write an RC query to find all people who have a neighbor that has a colleague:
A(x) = ∃y. ∃z. ∃n. Neighbors(x, y, n) ∧ ∃m. Colleagues(y, z, m)

Write an RC query to find all people who have only neighbors that are also their colleagues:
A(x) = ∃m. ∃n. Neighbors(x, m, n) ∧ (∀y. ∃o. Neighbors(x, y, o) ⇒ ∃d. Colleagues(x, y, d))

Write a datalog query to find all people who have only neighbors that are also their colleagues:
C(x) :- Neighbors(x, y, _), Colleagues(_, _, d1), not Colleagues(x, y, d1)
A(x) :- Neighbors(x, y, -), not C(x)

Write an RC query to find all people who have only neighbors that have at least one colleague.
A(x) = ∃m. ∃n. Neighbors(x, m, n) ∧ ∀y. (∃o. Neighbors(x, y, o) ⇒ ∃z. ∃d. Colleagues(y, z, d))
Question 3

Consider the following database schema:

Person(pid, name)
Trusts(pid1, pid2)

Answer each question below by writing a query in non-recursive datalog with negation. Return the person id and the name.

Write a datalog query to find the people who trust everyone except themselves:

\[ S(p) : - \text{Person}(p, -), \text{Person}(q, -), \text{not Trusts}(p, q), p \neq q \]
\[ S(p) : - \text{Person}(p, -), \text{Trusts}(p, p) \]
\[ A(p, n) : - \text{Person}(p, n), \text{not } S(p) \]

A “lone” is a person who trusts no-one but himself. Write a datalog query that returns all loners:

\[ NA(p) : - \text{Trusts}(p, x), p \neq x \]
\[ A(p, n) : - \text{Person}(p, n), \text{Trusts}(p, p), \text{not } NA(p) \]

A “loyal” is a person who trusts only those who trust him. Write a datalog query that returns all loyal people.

\[ NA(p) : - \text{Trusts}(p, x), \text{not Trusts}(x, p) \]
\[ A(p, n) : - \text{Person}(p, n), \text{not } NA(p) \]

A “ruler” is a person who trusts only those who trust only him. Write a datalog query that returns all rulers.

\[ NA(p) : - \text{Trusts}(p, x), \text{Trusts}(x, y), p \neq y \]
\[ A(p, n) : - \text{Person}(p, n), \text{not } NA(p) \]

Write an SQL query that returns all rulers.

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SELECT p.pid, p.name
FROM Person p
WHERE not exists
  (SELECT *
   FROM Trusts t1, Trusts t2
   WHERE t1.pid1 = p.pid and t1.pid2 = t2.pid1 and t1.pid1 <> t2.pid2)
```