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B9 – 1886
Sem – 4, Section - C

CST – 4305
Assignment – IV

I. Suppliers (sid: integer, sname: string, address: string)
Parts (pid: integer, pname: string, color: string)
Catalog (sid: integer, pid: integer, cost: real)

1. **Relational Algebra:**
   π_{sname} (($\sigma_{color='red'}$ Parts) ⋈ Catalog ⋈ Suppliers)

   Tuple Relational Calculus:
   {T | ∃ S ∈ Suppliers ∃ P ∈ Parts ∃ C ∈ Catalog (P.color = 'red' ∧ P.pid = C.pid ∧ C.sid = S.sid ∧ T.sname = S.sname)}

   Domain Relational Calculus:
   {<Sn> | <Si, Sn, Sa> ∈ Suppliers ∧ ∃ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ ∃ Cs, Cp, C | <Cs, Cp, C> ∈ Catalog ∧ Pc = 'red' ∧ Pi = Cp ∧ Cs = Si}

2. **Relational Algebra:**
   π_{sid} (($\sigma_{color='red' \vee color='green'}$ Parts) ⋈ Catalog)

   Tuple Relational Calculus:
   {T | ∃ P ∈ Parts ∃ C ∈ Catalog ((P.color = 'red' ∨ P.color = 'green') ∧ P.pid = C.pid ∧ T.sid = C.sid)}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∃ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ (Pn = 'red' ∨ Pn = 'green') ∧ Pi = Cp}

3. **Relational Algebra:**
   π_{sid} ((π_{pid} ($\sigma_{color='red'}$ Parts) ⋈ Catalog) ∪ ($\sigma_{address='221\ Parker\ Street'}$ Suppliers))

   Tuple Relational Calculus:
   {T | ∃ S ∈ Suppliers ∃ P ∈ Parts ∃ C ∈ Catalog ((P.color = 'red' ∧ P.pid = C.pid ∧ T.sid = C.sid) ∨ (S.address = '221 Parker Street' ∧ T.sid = S.sid))}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∃ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ ∃ Cs, Sn, A | <Cs, Sn, Sa> ∈ Suppliers ∧ (Pc = 'red' ∧ Pi = Cp) ∨ Sa = '221 Packer Street'}

4. **Relational Algebra:**
   $\pi_{sid}((\sigma_{color='red'} Parts) \bowtie Catalog) \cup \pi_{sid}((\sigma_{color='red'} Parts) \bowtie Catalog)$

   Tuple Relational Calculus:
   {T | ∃ P1 ∈ Parts ∃ C1 ∈ Catalog ∃ P2 ∈ Parts ∃ C2 ∈ Catalog (((P1.color = 'red' ∧ P1.pid = C1.pid) ∧ (P2.color = 'green' ∧ P2.pid = C2.pid)) ∧ C1.sid = C2.sid ∧ T.sid = C1.sid)}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∃ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ Pc = 'red' ∧ Pi = Cp ∧ ∃ P, Q, R | <P, Q, R> ∈ Catalog ∧ ∃ X, Y, Z | < X, Y, Z> ∈ Parts ∧ Z = 'green' ∧ X = Q ∧ P = Cs}

5. **Relational Algebra:**
   $(\pi_{sid, pid} Catalog) / (\pi_{pid} Parts)$

   Tuple Relational Calculus:
   {T | ∀ P ∈ Parts ∃ C ∈ Catalog C2 ∈ Catalog (C2.pid = P.pid ∧ C2.sid = C1.sid ∧ T.sid = C1.sid)}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∀ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ ∃ P, Q, R | <P, Q, R> ∈ Catalog ∧ Q = Pi ∧ P = Cs}

6. **Relational Algebra:**
   $(\pi_{sid, pid} Catalog) / (\pi_{pid}(\sigma_{color='red'} Parts))$

   Tuple Relational Calculus:
   {T |∀ P ∈ Parts ∃ C1 ∈ Catalog ∃ C2 ∈ Catalog ((P.color ≠ 'red' ∨ (C2.pid = P.pid ∧ C2.sid = C1.sid)) ∧ T.sid = C1.sid)}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∀ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ Pc ≠ 'red' ∨ ∃ P, Q, R | <P, Q, R> ∈ Catalog ∧ Q = Pi ∧ P =Cs}

7. **Relational Algebra:**
   $(\pi_{sid, pid} Catalog) / (\pi_{pid}(\sigma_{color='red' \vee color='green'} Parts))$

   Tuple Relational Calculus:
   {T | ∀ P ∈ Parts ∃ C1 ∈ Catalog ∃ C2 ∈ Catalog ((P.color ≠ 'red' ∧ P.color ≠ 'green') ∨ (C2.pid = P.pid ∧ C2.sid = C1.sid) ∧ T.sid = C1.sid)}

   Domain Relational Calculus:
   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∀ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ Pc ≠ 'red' ∧ Pc ≠ 'green' ∨ ∃ P, Q, R | <P, Q, R> ∈ Catalog ∧ Q = Pi ∧ P =Cs}

8. **Relational Algebra:**

   $((\pi_{sid,\ pid}\ Catalog) / (\pi_{pid}\ (\sigma_{color='red'}\ Parts))) \cup ((\pi_{sid,\ pid}\ Catalog) / (\pi_{pid}\ (\sigma_{color='green'}\ Parts)))$

   Tuple Relational Calculus:

   {T |∀ P1 ∈ Parts ∀ P2 ∈ Parts ∃ C1 ∈ Catalog ∃ C2 ∈ Catalog ∃ C3 ∈ Catalog ((P1.color ≠ 'red' ∨ (C2.pid = P1.pid ∧ C2.sid = C1.sid)) ∨ (P2.color ≠ 'green' ∨ (C3.pid = P2.pid ∧ C3.sid = C1.sid)) ∧ T.sid = C1.sid)}

   Domain Relational Calculus:

   {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∀ Pi, Pn, Pc | <Pi, Pn, Pc> ∈ Parts ∧ Pc ≠ 'red' ∨
   ∃ P, Q, R | <P, Q, R> ∈ Catalog ∧ Q = Pi ∧ P = Cs ∨
   ∀ X, Y, Z | <X, Y, Z> ∈ Parts ∧ Z ≠ 'green' V
   ∃ M, N, L | <M, N, L> ∈ Catalog ∧ N = X ∧ M = Cs}

9. **Relational Algebra:**

   ρ (T1, Catalog)
   ρ (T2, Catalog)
   $\pi_{T1.sid,\ T2.sid}\ (\sigma_{T1.pid=T2.pid\ \wedge\ T1.sid\neq T2.sid\ \wedge\ T1.cost>T2.cost}\ (T1 \times T2))$

   Tuple Relational Calculus:

   {T | ∃ C1 ∈ Catalog ∃ C2 ∈ Catalog (C2.pid = C1.pid ∧ C2.sid ≠ C1.sid ∧ C2.cost < C1.cost ∧ T.sid2 = C2.sid ∧ T.sid1 = C1.sid)}

   Domain Relational Calculus:

   {<Cs, X> | <Cs, Cp, C> ∈ Catalog ∧ ∃ X, Y, Z | <X, Y, Z> ∈ Catalog ∧ Y = Cp ∧ X ≠ Cs ∧ Z < C}

10. **Relational Algebra:**

    ρ (T1, Catalog)
    ρ (T2, Catalog)
    $\pi_{T1.pid}\ (\sigma_{T1.pid=T2.pid\ \wedge\ T1.sid\neq T2.sid}\ (T1 \times T2))$

    Tuple Relational Calculus:

    {T | ∃ C1 ∈ Catalog ∃ C2 ∈ Catalog (C2.pid = C1.pid ∧ C2.sid ≠ C1.sid ∧ T.pid = C1.pid)}

    Domain Relational Calculus:

    {<Cs> | <Cs, Cp, C> ∈ Catalog ∧ ∃ X, Y, Z | <X, Y, Z> ∈ Catalog ∧ Y = Cp ∧ X ≠ Cs}