Heuristic Rules :

*Rule 1:* Conjunctive Selection operations

σp∧q∧r(R) = σp(σq(σr(R)))

*Rule 2:* Commutativity of Selection operations

σp(σq(R)) = σq(σp(R))

*Rule 3:* Sequence of Projection operations

ΠLΠM … ΠN(R) = ΠL (R)

*Rule 4:* Commutativity of Selection and Projection

ΠAi, …, Am(σp(R)) = σp(ΠAi, …, Am(R)) where p∈ {A1, A2, …, Am}

*Rule 5:* Commutativity of Theta join (and Cartesian product)

R p S = S p R

R X S = S X R

*Rule 6*: Commutativity of Selection and Theta join (or Cartesian product)

σp(R r S) = (σp(R)) r S

σp(R X S) = (σp(R)) X S where p∈ {A1, A2, …, An}

*Rule 7:* Commutativity of Projection and Theta join (or Cartesian product)

ΠL1∪L2(R r S) = (ΠL1(R)) r (ΠL2(S))

ΠL1∪L2(R r S) = ΠL1∪L2( (ΠL1∪M1(R)) r (ΠL2∪M2(S)))

*Rule 8:* Commutativity of Union and Intersection

R ∪ S = S ∪ R

R ∩ S = S ∩ R

*Rule 9:* Commutativity of Selection and set operations

σp(R ∪ S) = σp(R) ∪ σp(S)

σp(R ∩ S) = σp(R) ∩ σp(S)

σp(R - S) = σp(R) - σp(S)

*Rule 10:* Commutativity of Projection and Union

ΠL(R ∪ S) = ΠL(S) ∪ ΠL(R)

*Rule 11:* Associativity of Theta join (and Cartesian product)

(R S) T = R (S T)

(R X S) X T = R X (S X T)

*Rule 12:* Associativity of Union and Intersection (but not Set difference)

(R ∪ S) ∪ T = S ∪ (R ∪ T)

(R ∩ S) ∩ T = S ∩ (R ∩ T)

*Rule 13:* Combine the Cartesian product with a Selection operation into a Join operation

σp(R X S) = R p S