

4.3 Solve:

1. TRC:

$$\{T|\exists T1 \in Suppliers(\exists X \in Parts(X.color = red \wedge \exists Y \in Catalog(Y.pid = X.pid \wedge Y.sid = T1.sid)) \wedge T.sname = T1.sname)\}$$

DRC:

$$\{\langle Y \rangle | \langle X, Y, Z \rangle \in Suppliers \wedge \exists P, Q, R(\langle P, Q, R \rangle \in Parts \wedge R = red \wedge \exists I, J, K(\langle I, J, K \rangle \in Catalog \wedge J = P \wedge I = X))\}$$

2. TRC:

$$\{T|\exists T1 \in Catalog(\exists X \in Parts((X.color = red \vee X.color = green) \wedge X.pid = T1.pid) \wedge T.sid = T1.sid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \exists A, B, C(\langle A, B, C \rangle \in Parts \wedge (C = red \vee C = green) \wedge A = Y)\}$$

3. TRC:

$$\{T|\exists T1 \in Catalog(\exists X \in Parts(X.color = red \wedge X.pid = T1.pid) \wedge T.sid = T1.sid) \vee \exists T2 \in Suppliers(T2.address = 221PackerStreet \wedge T.sid = T2.sid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \exists A, B, C(\langle A, B, C \rangle \in Parts \wedge C = red \wedge A = Y) \vee \exists P, Q, R(\langle X, P, Q \rangle \in Suppliers \wedge Q = 221PackerStreet)\}$$

4. TRC:

$$\{T|\exists T1 \in Catalog(\exists X \in Parts(X.color = red \wedge X.pid = T1.pid) \wedge \exists T2 \in Catalog(\exists Y \in Parts(Y.color = green \wedge Y.pid = T2.pid) \wedge T2.sid = T1.sid))\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \exists A, B, C(\langle A, B, C \rangle \in Parts \wedge C = red \wedge A = Y) \wedge \exists P, Q, R(\langle P, Q, R \rangle \in Catalog \wedge \exists E, F, G(\langle E, F, G \rangle \in Parts \wedge G = green))\}$$

5. TRC:

$$\{T|\exists T1 \in Catalog(\forall X \in Parts(\exists T2 \in Catalog(T2.pid = X.pid \wedge T2.sid = T1.sid)) \wedge T.sid = T1.sid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \forall \langle A, B, C \rangle \in Parts(\exists \langle P, Q, R \rangle \in Catalog(Q = A \wedge P = X))\}$$

6. TRC:

$$\{T|\exists T1 \in Catalog(\forall X \in Parts(X.color \neq red \vee \exists T2 \in Catalog(T2.pid = X.pid \wedge T2.sid = T1.sid)) \wedge T.sid = T1.sid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \forall \langle A, B, C \rangle \in Parts(C \neq red \vee \exists \langle P, Q, R \rangle \in Catalog(Q = A \wedge P = X))\}$$

7. TRC:

$$\{T|T1 \in Catalog(\forall X \in Parts((X.color \neq red \wedge X.color \neq green) \vee \exists T2 \in Catalog(T2.pid = X.pid \wedge T2.sid = T1.sid)) \wedge T.sid = T1.sid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \forall \langle A, B, C \rangle \in Parts((C \neq red \wedge C \neq green) \vee \exists \langle P, Q, R \rangle \in Catalog(Q = A \wedge P = X))\}$$

8. TRC:

$$\left\{ \left\{ T | T1 \in Catalog((\forall X \in Parts(X.color \neq red \vee \exists Y \in Catalog(Y.pid = X.pid \wedge Y.sid = T1.sid)) \vee \forall Z \in Parts(Z.color \neq green \vee \exists P \in Catalog(P.pid = Z.pid \wedge P.sid = T1.sid))) \wedge T.sid = T1.sid \right\} \right\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge (\forall \langle A, B, C \rangle \in Parts(C \neq red \vee \exists \langle P, Q, R \rangle \in Catalog(Q = A \wedge P = X))) \vee \forall \langle U, V, W \rangle \in Parts(W \neq green \vee \langle M, N, L \rangle \in Catalog(M = U \wedge N = V \wedge L = W))\}$$

9. TRC:

$$\{T|\exists T1 \in Catalog(\exists T2 \in Catalog(T2.pid = T1.pid \wedge T2.sid \neq T1.sid \wedge T2.cost < T1.cost \wedge T.sid2 = T2.sid) \wedge T.sid = T1.sid)\}$$

DRC:

$$\{\langle X, P \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \exists P, Q, R(\langle P, Q, R \rangle \in Catalog \wedge Q = Y \wedge P \neq X \wedge R < Z)\}$$

10. TRC:

$$\{T|T1 \in Catalog(\exists T2 \in Catalog(T2.pid = T1.pid \wedge T2.sid \neq T1.sid) \wedge T.pid = T1.pid)\}$$

DRC:

$$\{\langle X \rangle | \langle X, Y, Z \rangle \in Catalog \wedge \exists A, B, C(\langle A, B, C \rangle \in Catalog \wedge B = Y \wedge A \neq X)\}$$