CS2102 Query Languages (Solutions)

pizza (pcode, pname, psize)

store (sname, sarea, sphone)

sells (sname, pcode, sprice)

1. Find the names of pizzas that come in a 10 inch size.

   $\{T \mid \exists T1\ (T1 \in pizza \wedge T1.size = 10 \wedge T.name=T1.name)\}$
   $\{<Y> \mid \exists X\ \exists Z\ (pizza(X, Y, Z) \wedge Z = 10)\}$

2. Find the names of pizzas that come in a 10 inch or a 12 inch size.

   $\{T \mid \exists T1\ (T1 \in pizza \wedge (T1.size = 10 \vee T1.size=12) \wedge T.name=T1.name)\}$
   $\{<Y> \mid \exists X\ \exists Z\ (pizza(X, Y, Z) \wedge (Z = 10 \vee Z = 12))\}$

3. Find the names of pizzas that come in both a 10 inch and a 12 inch size.

   ~~$\{T \mid \exists T1\ (T1 \in pizza \wedge (T1.size = 10 \wedge T1.size=12) \wedge T.name=T1.name)\}$~~
   The result is always empty.

   $\{T \mid \exists T1\ \exists T2\ (T1 \in pizza \wedge T2 \in pizza \wedge T1.psize = 10 \wedge T2.psize=12 \wedge T1.pname=T2.pname \wedge T1.pcode < T2.pcode \wedge T.pname=T1.pname)\}$
   $\{<Y1> \mid \exists X1\ \exists Z1\ \exists X2\ \exists Y2\ \exists Z2\ (pizza(X1, Y1, Z1) \wedge pizza(X1, Y1, Z1) \wedge Y1 = Y2 \wedge Z1 = 10 \wedge Z2 = 12)\}$

4. Find the names and phone numbers of the stores in "Pioneer" or "Tuas" that sell a 10 inch pizza named "pepperoni" for less than $22.

   $\{T \mid \exists T1\ \exists T2\ \exists T3\ (T1 \in pizza \wedge T2 \in store \wedge T3 \in sells \wedge T1.pcode=T3.pcode \wedge T2.sname=T3.sname \wedge (T3.sarea = \text{'Pioneer'} \vee T3.sarea = \text{'Tuas'}) \wedge T1.psize = 10 \wedge T3.sprice < 22) \wedge T.sname= T2.sname \wedge T.sphone = T2.sphone\ \}$

   $\{<X2, Z2> \mid \exists X1\ \exists Y1\ \exists Z1\ \exists Y2\ \exists X3\ \exists Y3\ \exists Z3\ (pizza(X1, Y1, Z1) \wedge store(X2, Y2, Z2) \wedge sells(X3, Y3, Z3) \wedge X1 = Y3 \wedge X2 = X3 \wedge (Y2 = \text{'Pioneer'} \vee Y2 = \text{'Tuas'}) \wedge Z1 = 10 \wedge Z3 < 22\ )\}$

5. Find the codes of the most expensive pizzas – assume that the schema of the database is reduced to a relation pizza(pcode, pprice) for the sake of simplicity.

   $\{T \mid \exists T1 \ \forall T2 \ (T1 \in pizza \wedge (T2 \in pizza \Rightarrow T1.pprice >= T2.pprice) \wedge T.pcode = T1.pcode)\}$

   $\{<X1> \mid \exists Y1 \ \forall X2 \ \forall Y2 \ (pizza(X1, Y1) \ \wedge (pizza(X2, Y2) \Rightarrow Y1 >= Y2))\}$

6. Find the names of the stores that sell all the pizzas.
   $\{T \mid \exists T1 \ \forall T2 \ \exists T3 \ (T1 \in store \wedge \ (T2 \in pizza \Rightarrow (T3 \in sells \wedge T1.pname = T3.pname \wedge T2.pcode = T3.pcode)) \wedge T.sname=T1.sname)\}$

   $\{<X1> \mid \exists Y1 \ \exists Z1 \ \forall X2 \ \forall Y2 \ \forall Z2 \ \exists X3 \ \exists Y3 \ \exists Z3 \ (store(X1, Y1, Z1) \wedge \ (pizza(X2, Y2, Z2) \Rightarrow (sells(X3, Y3, Z3) \wedge X1 = X3 \wedge X2 = Y3)))\}$