# CSC520 Assignment 3

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## 1  Question 1

### 1.a

1. tea(Black) $\wedge\neg$ tea(cheese)
2. Blend(Black, Green)
3. $\forall$ X ¬tea(X) $\implies$ ¬$\exists$ Y tea(Y) $\wedge$ Blend(X, Y)
4. $\exists$ X tea(X) $\wedge\neg$ wilt(X) $\wedge$ unoxidize(X)
5. $\exists$ X $\forall$ Y tea(X) $\wedge$ Blend(X, Y) $\wedge\neg$ unoxidize(Y)

### 1.b

1. tea(Black) $\wedge\neg$ tea(cheese)
2. Blend(Black, Green)
3. tea(X) $\vee$¬tea(Y) $\vee\neg$ Blend(X, Y)
4. tea($X_1$) $\wedge\neg$ wilt($X_1$) $\wedge$ unoxidize($X_1$)
5. tea($X_1$) $\wedge$ Blend($X_1$, Y) $\wedge\neg$ unoxidize(Y)

## 2  Question 2

### 2.a

Here are the statements in propositional logic form
1. o $\wedge$ l
2. o $\wedge$ d
3. o $\wedge$ s $\implies i$
4. ¬$s_{carol}$
5. o $\implies$ g $\vee$ si
6. $o_{carol}$
7. $g_{carol} \wedge \neg pre_{carol} \wedge \neg s_{carol} \wedge \neg i_{carol}$
8. pre $\implies$ g $\wedge$ i

And now in CNF
1. o $\wedge$ l
2. o $\wedge$ d

3. ¬ o ∨ ¬ s ∨ i
4. $\neg s_{carol}$
5. ¬ o ∨ g ∨ si
6. $o_{carol}$
7. $g_{carol} \land \neg pre_{carol} \land \neg s_{carol} \land \neg i_{carol}$
8. (¬ pre ∨ g) ∧ (¬ pre ∨ i)

This database is consistent. The following truth table displays the values in which this configuration is correct

| $s_{carol}$ | $o_{carol}$ | $i_{carol}$ | d | $g_{carol}$ | si | $pre_{carol}$ | l | c |
|---|---|---|---|---|---|---|---|---|
| F | T | F | T | T | dontcare | F | T | T |

The *dontcare* value for si indicated that its value doesn't change the consistency of the database as a whole. Clause 5 dictates that at minimum one of its propositions be true, in which case g is true. Therefore, the value of si doesn't change the consistency of the database, so its value can be either true or false.

## 2.b

If Carol can shop at Costco stores, then statements 4 and 7 change to the following
4. $s_{carol}$
7. $g_{carol} \land \neg pre_{carol} \land s_{carol} \land \neg i_{carol}$
This causes the consistency of the database to change, in that it is no longer consistent.
9. ¬ s ∨ i (Combine 3  6)
10. i (Combine 4  9)
11. ⇒⇐ Contradiction (Combine 7 and 10)

The assertion that Carol can shop at Costco means that she must have her identification card with her when she goes to shop. However, in statement 7, we have proved that she does not in fact have her identification card with her. So, therein lies a contradiction in the new database and the consistency is voided.