CSC 503 Homework Assignment 6

Out: October 17, 2018
Due: October 26, 2018
Unity ID: zzha

1. **[10 points]** Rewrite the formula

$$(P(x,y) \rightarrow (\neg Q(x,y) \wedge R(y,z))) \wedge (P(x,y) \wedge S(y,x))$$

in clausal form set notation.

2. **[10 points]** Rewrite the statement

$$\{\ \{R(x,y,z), S(y,z), S(x,y)\},\ \{P(x), S(x,y), \neg R(y,y,x)\},\ \{P(y), \neg S(y,x)\}\ \}$$

so that the variables in each clause are standardized apart.

3. **[20 points]** Convert the formula

$$\forall x\ [P(x,y) \leftrightarrow (\forall y\ (R(x,y) \rightarrow Q(x,y)))]$$

to negation normal form, showing the steps of the conversion.

4. **[20 points]** Convert the sentence

$$\exists x\ \forall y\ \ ([P(x,y) \wedge (\forall z\ Q(y,z))] \vee [\exists u\ \exists v\ (P(x,u) \wedge R(y,v))])$$

to Skolem form, showing the steps of the conversion.

5. **[20 points]** Convert the formula

$$\exists x\ [(\forall y\ P(x,y)) \rightarrow (\exists z\ Q(x,z))]$$

to prenex normal form, showing the steps of the conversion.

6. **[20 points]** Compute the product substitution $\theta\sigma$ for

$$\begin{aligned} \theta &= \{a/x, b/y, f(y)/z, v/w, c/u\} \\ \sigma &= \{f(y)/x, g(z)/y, w/v\} \end{aligned}$$