**Practice Final Exam**
Phi 321 Formal Logic
Fall 2015, Jared Bates

**Part 1.** Translations. Translate the following sentences into the symbolic language using the scheme of abbreviations provided. (10 pts each)

1. Unless Paris returns Helen, Agamemnon wages war. (R: Paris returns Helen. A: Agamemnon wages war.)

2. All Trojans fear some Achaeans who fear Hector. (Tx: x is a Trojan. Fxy: x fears y. Ax: x is an Achaean. h: Hector)

3. At least two different Trojans have fought Ajax. (Tx: x is Trojan. Fxy: x fought y. a: Ajax)

4. Achilles loathes the father of Iphigenia. (Lxy: x loathes y. Fxy: x is a father of y. a: Achilles i: Iphigenia)

**Part 2.** Formal semantics. Construct interpretations or (full) truth tables, as appropriate, to solve the following problems. For interpretations, use small, numerical domains and verify your interpretations with full semantic trees. (10 pts each)

5. Show whether the following sentence is truth-functionally true, false or indeterminate.
$(A \vee S) \supset (S \vee (\sim G \vee A))$

6. Show that the following pair of sentences is not quantificationally equivalent.
$(\exists x)(Hx \,\&\, Rx)$. $(\forall x)(Hx \supset Rx) \,\&\, (\exists x)Hx$

7. Show that the following sentence is not quantificationally true.
$(\exists x)((\forall y)(Cy \equiv y=x) \,\&\, Dx)$

8. Show that the following argument is quantificationally invalid.
$(\forall x)(Cx \equiv x=a)$. $\sim Cb \,\&\, Cd$. $\therefore$ $(\exists x)(\exists y)((Cx \,\&\, Cy) \,\&\, x \neq y)$

**Part 3.** Derivations. Demonstrate the validity of the following arguments by constructing derivations. (10 pts each)

9. $J \vee M$. $J \supset \sim K$. $M \supset \sim K$. $\therefore$ $\sim K$

10. $\therefore$ $(\forall x)(Ax \supset Bx) \supset ((\forall x)Ax \supset (\forall x)Bx)$

11. $a=c$. $c=d$. $d=e$. Faadc. $\therefore$ Feeee

12. $(\exists x)(Fx \,\&\, (\forall y)(\sim Gxy \equiv Syx))$. $(\forall x)(a=a \supset (\exists y)Syx)$. $\therefore \sim (\forall x)(\forall y)Gyx$

13. $(\forall x)(\forall y)((Lxn \,\&\, Lyn) \supset x=y)$. $(\exists x)(Lxn \,\&\, Rx)$. $\therefore$ $(\forall x)(Lxn \supset Rn)$

**Part 4.** Combination. Translate the following argument into the symbolic language using the scheme of abbreviations provided. If your symbolization is valid, demonstrate its validity by constructing an appropriate derivation. If your symbolization is invalid, demonstrate its invalidity by constructing an appropriate interpretation, and then verify the interpretation with full semantic trees. (20 pts)

14. Some saints pray only for themselves. All virtuous people pray for others (i.e., individuals other than themselves). Therefore, not all saints are virtuous people. (Sx: x is a saint. Pxy: x prays for y. Vx: x is a virtuous person.)