THE UNIVERSITY OF BRITISH COLUMBIA

Philosophy 220A

Symbolic Logic I

FAKE MIDTERM EXAMINATION

TIME: 50 MINUTES

NAME: _____

STUDENT NUMBER: _____

SPECIAL INSTRUCTIONS:

Answer all questions. If you get stuck on a question, go on to the next, and return to it later. Indeed, it is wise to read the whole paper before you start, and begin with the easiest questions. Including this cover page, and the sheet of rules, this examination booklet should consist of five pages. Check that these are all present before the examination begins.

Your answers to questions 1 to 4 should be written in this booklet, in the spaces provided. Your proofs (for question 5) should be written in the separate answer booklet.

For rough work, you may use the plain backs of the sheets in this booklet, or pages at the *end* of the separate answer booklet.

SECTION
INSTRUCTOR: Richard Johns
TEACHING ASSISTANT:

1. Translate the following sentences from English to FOL, or FOL to English, using the dictionary provided.

Cube(x) Large(x) Larger(x, y) Adjoins(x,y) Tet(x) Small(x)
Medium(x) SameSize(x, y)

(i) Assuming *b* is large and *c* isn't, *b* is larger than *c*. _____

(ii) Unless *a* is small, it is the same size as *c* just in case *c* isn't a tetrahedron.

_____

(iii) $(\text{Cube}(a) \leftrightarrow \text{Small}(a)) \wedge (\text{Tet}(a) \rightarrow \text{Medium}(a))$

_____

2.

$\text{Larger}(a, b) \vee \text{Cube}(c)$
$a = b$
$\therefore \neg\text{Tet}(c)$

(i) Is the argument above logically valid? _____ (Yes/ No)

(ii) Is the argument above TT valid? (I.e. is the conclusion a *tautological* consequence of the premisses?)

_____ (Yes/ No)

(iii) If the answer to either question above is *No*, then demonstrate that this answer is correct by providing a world, or assignment of truth values to atomic sentences, as appropriate. (Write your answer in the space below.)

3. Use a truth table to determine whether or not the following sentences are tautologically (TT) equivalent.

$(P \wedge \neg Q) \rightarrow R$ $\qquad\qquad$ $\neg R \rightarrow (\neg Q \rightarrow \neg P)$

Answer: _____ [2 marks]

4. Show that the following argument is not logically valid, by constructing an appropriate world.

$\text{Medium}(a) \vee (\neg \text{Tet}(a) \rightarrow \text{Small}(a))$
$\text{SameShape}(a, b)$
$\text{Smaller}(b, a) \vee (\text{Cube}(a) \wedge \text{Dodec}(b))$
$\therefore \text{Small}(b)$

[Draw your world here. Note that the positions are the blocks are irrelevant in this case.]

5. For each of the following arguments, prove that the argument is valid by providing a formal proof (in $\mathcal{F}$) of the conclusion from the premises.

(i)

$$\begin{array}{|l} (C \vee G) \rightarrow (A \wedge B) \\ \hline C \rightarrow A \end{array}$$

(ii)

$$\begin{array}{|l} (D \wedge E) \rightarrow \neg F \\ F \vee (G \wedge W) \\ D \rightarrow E \\ \hline D \rightarrow G \end{array}$$

(iii)

$$\begin{array}{|l} A \leftrightarrow \neg D \\ (D \vee H) \rightarrow B \\ \neg(B \vee G) \\ \hline A \end{array}$$

Total: _____