University of Malta
Dept. of Philosophy

Tuesday 27th January 2009 — PHI 2001 – LOGIC — 09.15 – 11.15

A list of logical rules is appended to this examination paper to assist candidates.
Answer all questions.

1) (i) $a \sqcup b$ is defined as $(a \vee b) \wedge \neg(a \wedge b)$. Work out its truth-table. *(3 marks)*
(ii) Show that the truth-table of $\neg(a \leftrightarrow b)$ is the same as that of $a \sqcup b$. *(3 marks)*
(iii) Show by means of a truth-table that $\rightarrow$ is distributive over itself, i.e. that $a \rightarrow (b \rightarrow c) >< (a \rightarrow b) \rightarrow (a \rightarrow c)$ is valid. *(5 marks)*
(iv) Show by means of a truth-table that the Modus Ponens implication is valid, i.e. that $A \rightarrow B$,, $A < B$ is valid. *(3 marks)*

2) Find out by means of *effective scenario tableaux* whether the arguments:
(i) $\neg \mathfrak{a} \vee \neg \mathfrak{b} \prec \neg(\mathfrak{a} \wedge \mathfrak{b})$
(ii) $\neg(\mathfrak{a} \wedge \mathfrak{b}) \prec \neg \mathfrak{a} \vee \neg \mathfrak{b}$
are effectively sound. *Give reasons for your answers. (7 marks each)*

3) Given that $\mathfrak{a}$ and $\mathfrak{b}$ are truth-indefinite primary propositions, find out by means of *dialogues* whether the arguments/propositions:
(i) $\mathfrak{a} \rightarrow \mathfrak{b} \prec \neg \mathfrak{b} \rightarrow \neg \mathfrak{a}$
(ii) $\neg\neg \mathfrak{a} \rightarrow \mathfrak{a}$
are effectively and/or classically sound/true. *(7 marks each)*

4) Find out by means of *dialogue-based developments* whether the arguments/propositions:
(i) $\mathfrak{a} \wedge (\mathfrak{b} \vee \mathfrak{c}) \prec (\mathfrak{a} \wedge \mathfrak{b}) \vee (\mathfrak{a} \wedge \mathfrak{c})$
(ii) $\neg(\mathfrak{a} \wedge \neg \mathfrak{a})$
are effectively and/or classically sound/true. *(6 marks each)*

5) Within classical logic, 'proposition $\mathfrak{A}$ is *contrary* to proposition $\mathfrak{B}$' means that $\mathfrak{A} \prec \neg \mathfrak{B}$ is sound. What do the following mean ? *(1½ marks each)*
(i) $\mathfrak{A}$ is *subcontrary* to $\mathfrak{B}$
(ii) $\mathfrak{A}$ is *contradictory* to $\mathfrak{B}$

6) Write down: *(1 mark each)*
the contrary, if any, of "Some man is wise";
the subcontrary, if any, of "Some man is wise";
the contradictory, if any, of "Some man is wise";
the subaltern, if any, of "Some man is wise";
the superaltern, if any, of "Some man is wise".

7) Show by means of two Beth Tableaux that the a-type proposition SaP $[\bigwedge_x .S(x) \rightarrow P(x).]$ is classically contradictory to the o-type proposition SoP $[\bigvee_x .S(x) \wedge \neg P(x).]$, i.e that (i) $SaP \prec \neg SoP$ and (ii) $\neg SaP \prec SoP$ are both classically sound. *(6 marks each)*

8) Show by means of a Beth Tableau that, if the subject term S is occupied, the proposition SaP is accidentally convertible to the proposition PiS, i.e. that
$\bigvee_x S(x)$,, $\bigwedge_x .S(x) \rightarrow P(x). \prec \bigvee_x .P(x) \wedge S(x).$ is classically sound. *(6 marks)*