UNIVERSITY OF MALTA
FACULTY OF ARTS

JANUARY 2010 SESSION EXAMINATIONS

PHI2001 Logic

Tuesday 26th January 2010

10.30 ~ 12.30

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20 marks are allotted to attendance at lectures and 80 marks to the written examination.

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

1) (i) $a \sqcup b$ is defined as $(a\wedge\neg b)\vee(b\wedge\neg a)$. Work out its truth-table. *(3 marks)*
   (ii) Show that the truth-table of $(a\vee b) \wedge \neg(a\wedge b)$ is the same as that of $a\sqcup b$. *(3 marks)*
   (iii) Show by means of a truth-table that $\rightarrow$ is distributive over $\wedge$, i.e. that $a\rightarrow(b\wedge c) \succ\!\prec (a\rightarrow b)\wedge(a\rightarrow c)$ is valid. *(5 marks)*
   (iv) Show by means of a truth-table that Denying the Antecedent is fallacious, i.e. that $A\rightarrow B$,, $\neg A \prec \neg B$ is invalid. *(3 marks)*

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

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

4) Find out by means of *dialogue-based developments* whether the arguments/propositions:
   (i) $(\mathfrak{a}\vee\mathfrak{b}) \wedge (\mathfrak{a}\vee\mathfrak{c}) \prec \mathfrak{a} \vee (\mathfrak{b} \wedge \mathfrak{c})$
   (ii) $\mathfrak{a} \rightarrow \neg\neg\mathfrak{a}$
   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 $\mathfrak{B}$

   cont A < ¬B
   Subcont ¬A < B
   contrad A >< ¬B

6) Write down: *(1 mark each)*
   the contrary, if any, of "No man is wise";
   the subcontrary, if any, of "No man is wise";
   the contradictory, if any, of "No man is wise";
   the subaltern, if any, of "No man is wise";
   the superaltern, if any, of "No man is wise".

7) Show by means of a Beth Tableau that, if the subject term S is nonempty, the proposition SaP is contrary to the proposition SeP, i.e. that
   $\bigvee_x S(x)$,, $\bigwedge_x .S(x)\rightarrow P(x). \prec \neg \bigwedge_x .S(x)\rightarrow\neg P(x).$ is classically sound. *(7 marks)*

8) Show by means of a Beth Tableau that the 1st figure syllogism *Celarent* is classically sound. *(11 marks)*