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Final Examination
Philosophy 134
Spring, 2007

1. Show, using the derivation rules for *S5D*, that the following derivability relation holds in *S5D*:

$$\{\Diamond \Box A\} \vdash_{S5D} \Box \Diamond A$$

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2. Show, using the semantical rules for *S5I*, that the following semantical entailment fails in *S5I*:

$$\{\Box\Diamond A\} \not\vdash_{S5I} \Diamond\Box A$$

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3. Show, using a meta-logical derivation, that the following semantical entailment holds in $QIRCI-B$. Make the first lines of the derivation a statement of the relation of accessibility in BI and the next lines a statement of the relation between the domains of accessible worlds in $QIRCI$.

$$\{(\forall x)\Box Fx\} \vDash_{QIRCI-B} \Box(\forall x)Fx$$

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4. Using the derivational rules for $QIRD-T$, show that the following sentence is a theorem of $QIRD-T$:

$$\vdash_{QIRD-T} \sim \diamond((\forall x)\Box Fx \wedge \sim(\forall x)Fx)$$

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5. Show, using a semantic diagram, that the following entailment fails in *QIRI-S4*:

$$\{(\forall x)\diamond\diamond Fx\} \not\models_{QIRI-S4} \diamond(\forall x)Fx$$

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6. Consider a *QIRI-D* interpretation I with the following characteristics:

$$W = \{w_1, w_2, w_3\}$$

$$Rw_1w_2, Rw_2w_3, Rw_3w_1$$

$$D = \{1, 2, 3\}, D^{w_1} = \{1, 3\}, D^{w_2} = \{1, 2\}, D^{w_3} = \{2, 3\}$$

$$\text{For all } w_i \ v_I(a, w_i) = 3$$

$$v_I(F, w_1) = \{\langle 1, 2 \rangle, \langle 2, 3 \rangle, \langle 3, 1 \rangle\}, v_I(F, w_2) = \{\langle 2, 3 \rangle, \langle 1, 3 \rangle\}, v_I(F, w_3) = \{\langle 1, 2 \rangle\}$$

Using a semantic diagram, evaluate the following sentence at each world.

$$\diamond(\forall x)Fxa$$