Advanced Logic 2014–15
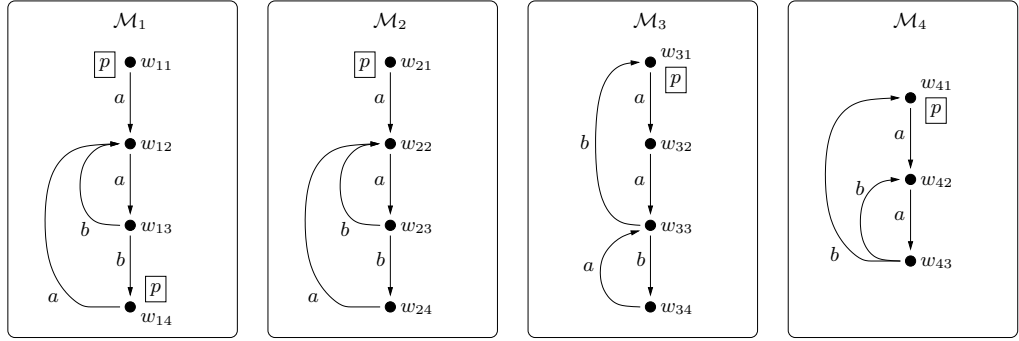
Assignment 2

(deadline: Monday, March 2)

1. Show that $\Box\Diamond\Box\Diamond p \to \Box\Diamond p$ is valid on all reflexive, transitive frames.

2. Show that validity of $\Box(\Box p \to p) \to \Box p$ on a frame $\mathcal{F}$ implies transitivity of $\mathcal{F}$.

3. Use semantic tableaux to check universal validity of the following formulas:

(a) $\Diamond p \to \Box q \vee \Diamond(p \wedge \neg q)$

(b) $\Diamond p \to \Diamond q \vee \Diamond(p \wedge \neg q)$

4. Consider the following multi-modal models over the index set $\{a, b\}$:

For which $i, j \in \{1, 2, 3, 4\}$ with $i \neq j$ do we have that $w_{i1} \rightsquigarrow w_{j1}$ (i.e., $\forall\varphi\,(\mathcal{M}_i, w_{i1} \vDash \varphi$ iff $\mathcal{M}_j, w_{j1} \vDash \varphi))$? Prove the modal equivalences you find, or give a distinguishing formula.