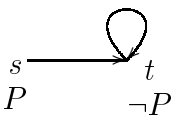
Tik-79.146 **Kevät 2000**
Logiikka tietotekniikassa: erityiskysymyksiä I
Laskuharjoitus 11
Ratkaisut

1. (a) $P \wedge \mathbf{EF}Q$
   (b) $\mathbf{EX}(P \wedge \mathbf{EX}Q)$
   (c) $\mathbf{AG}\big(P \rightarrow \mathbf{AX}(P \rightarrow \mathbf{EF}Q)\big)$
   (d) $\big(P \rightarrow \mathbf{A}(P\mathbf{U}Q)\big) \wedge \big(\neg P \rightarrow \mathbf{AX}(P \vee \mathbf{AX}P)\big)$
   (e) $\mathbf{AG}\big(P \rightarrow \mathbf{AG}(\neg Q \wedge \neg R)\big) \wedge \mathbf{AG}\big((Q \vee R) \rightarrow \mathbf{AG}\neg P\big)$

2. a) $\mathcal{M} = \langle S, R, v\rangle$, missä $S = \{s, t\}$, $R = \{\langle s, t\rangle, \langle t, t\rangle\}$, $v(s, P) = \mathit{true}$ ja $v(t, P) = \mathit{false}$.



$$\mathcal{M}, s \models \mathbf{AF}P,$$

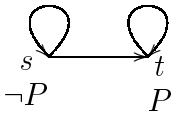
mutta

$$\mathcal{M}, (s, t, t, \dots) \not\models \mathbf{GF}P,$$

koska

$$\mathcal{M}, (t, t, \dots) \not\models \mathbf{F}P.$$

b) $\mathcal{M} = \langle S, R, v\rangle$, missä $S = \{s, t\}$, $R = \{\langle s, s\rangle, \langle s, t\rangle, \langle t, t\rangle\}$, $v(s, P) = \mathit{false}$ ja $v(t, P) = \mathit{true}$.



$$\mathcal{M}, s \models \mathbf{EFAG}P \quad \text{ja} \quad \mathcal{M}, t \models \mathbf{EFAG}P,$$

koska

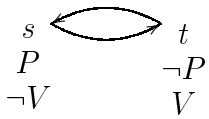
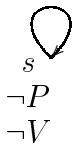
$$\mathcal{M}, t \models \mathbf{AG}P,$$

mutta

$$\mathcal{M}, (s, s, \dots) \not\models \mathbf{FG}P.$$

3. a) $\mathcal{M} = \langle S, R, v\rangle$, missä $S = \{s, t\}$, $R = \{\langle s, t\rangle, \langle t, s\rangle\}$, $v(s, P) = v(s, V) = \mathit{false}$ ja $v(t, P) = v(t, V) = \mathit{true}$.

b) $\mathcal{M} = \langle S, R, v\rangle$, missä $S = \{s, t\}$, $R = \{\langle s, t\rangle, \langle t, s\rangle\}$, $v(t, P) = v(s, V) = \mathit{false}$ ja $v(s, P) = v(t, V) = \mathit{true}$.



c) $\mathcal{M} = \langle S, R, v\rangle$, missä $S = \{s\}$, $R = \{\langle s, s\rangle\}$ $v(s, P) = v(s, V) = \mathit{false}$.