**T-79.146** **Kevät 2004**
**Logiikka tietotekniikassa: erityiskysymyksiä I**
**Laskuharjoitus 11**
**16.4.2004**

**1.** Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$\begin{aligned} S &= \{a, b, c, d, e, f\} \\ R &= \{\langle a, b\rangle, \langle b, c\rangle, \langle b, d\rangle, \langle b, e\rangle, \langle c, d\rangle, \langle d, d\rangle, \\ &\quad \langle e, e\rangle, \langle e, f\rangle, \langle f, a\rangle\} \\ \{s \in S \mid v(s, P) = \text{true}\} &= \{a, b, e\} \\ \{s \in S \mid v(s, Q) = \text{true}\} &= \{c, f\} \\ \{s \in S \mid v(s, R) = \text{true}\} &= \{f\} \end{aligned}$$

Olkoon $F = \{R\}$. Tutki, päteekö

a) $\mathcal{M}, a \models \mathbf{A}(P\mathbf{U}Q)$

b) $\mathcal{M}, a \models_F \mathbf{A}(P\mathbf{U}Q)$

c) $\mathcal{M}, a \models \mathbf{EG}P$

d) $\mathcal{M}, a \models_F \mathbf{EG}P$

**2.** Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$\begin{aligned} S &= \{a, b, c, d, e\} \\ R &= \{\langle a, b\rangle, \langle a, c\rangle, \langle a, d\rangle, \langle b, c\rangle, \langle b, d\rangle, \langle c, a\rangle, \\ &\quad \langle c, e\rangle, \langle d, b\rangle, \langle d, e\rangle, \langle e, b\rangle\} \\ \{s \in S \mid v(s, P) = \text{true}\} &= \{a, b\} \\ \{s \in S \mid v(s, Q) = \text{true}\} &= \{b, c, d\} \end{aligned}$$

Missä tiloissa lause

$$\mathbf{AXE}\big((P \to Q)\mathbf{U}(P \wedge Q)\big)$$

on tosi?

**3.** Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$\begin{aligned} S &= \{a, b, c, d, e\} \\ R &= \{\langle a, b\rangle, \langle a, c\rangle, \langle b, d\rangle, \langle d, b\rangle, \langle c, e\rangle, \langle e, c\rangle, \\ &\quad \langle d, e\rangle\} \\ \{s \in S \mid v(s, P) = \text{true}\} &= \{a, c\} \\ \{s \in S \mid v(s, Q) = \text{true}\} &= \{b, c\} \end{aligned}$$

Missä tiloissa lause

$$\mathbf{AG}\big(Q \to \mathbf{A}(\mathbf{EF}P\mathbf{U}\mathbf{AF}P)\big)$$

on tosi?