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10. Exercises for the Course 'Description Logics'

The following two exercises finish the proof of Lemma 4.18.

Exercise 39:

Show that exhaustive application of the normalization rules NF1-NF5 to a general $\mathcal{EL}$-TBox terminates in polynomial time.

Exercise 40:

Let $\mathcal{T}$ be a general $\mathcal{EL}$-TBox and $\hat{\mathcal{T}}$ the TBox obtained from exhaustive application of rules NF1-NF5 to $\mathcal{T}$. Show:

- $\hat{\mathcal{T}}$ is in normal form
- for all concept names A, B occurring in $\mathcal{T}$, $A \sqsubseteq_{\mathcal{T}} B$ iff $A \sqsubseteq_{\hat{\mathcal{T}}} B$.

Exercise 41:

Consider the TBox $\mathcal{T}$ having the following axioms:

$$\begin{aligned} A &\sqsubseteq B \sqcap \exists r.C \\ B \sqcap \exists r.B &\sqsubseteq C \sqcap D \\ C &\sqsubseteq \exists r.A \sqcap B \\ \exists r.\exists r.B \sqcap D &\sqsubseteq \exists r.(A \sqcap B) \end{aligned}$$

Test whether the following subsumption relations follow:

- $A \sqsubseteq C$,
- $A \sqsubseteq \exists r.\exists r.A$,
- $B \sqcap \exists r.A \sqsubseteq \exists r.C$.