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Exercises sheet OWL/DL – Reasoning

1. Translate the following axioms in to RDF Turtle

   - $Human \sqsubseteq \neg Alien$

   $\forall x(\text{Human}(x) \rightarrow \neg\text{Alien}(x))$

   - $FatherWithDaughters \sqsubseteq Man \sqcap \forall hasChild.Woman$

   $\forall x(\text{FatherWithDaughters}(x,y) \rightarrow \text{Man}(x) \wedge \forall y[\text{hasChild}(x, y) \wedge \text{Woman}(y)])$

   - $Sibling \sqsubseteq \exists parent.\exists hasChild.\neg Self$

   $\forall x(\text{Sibling}(x) \rightarrow \exists y[\text{parent}(x, y) \wedge \exists z[\text{hasChild}(y, z) \wedge \neg\text{Self}(z)]])$

2. Decide whether the following translations are correct or not. Explain your answer

a) Each Student had not wrote a habilitation

$Student \sqsubseteq \neg(\exists wrote.Habilitation)$

$\forall x(\text{Student}(x) \rightarrow \neg(\exists y[\text{wrote}(x, y) \wedge \text{Habilitation}(y)]))$

Also: $\forall x(\text{Student}(x) \rightarrow (\forall y[\neg\text{wrote}(x, y) \vee \neg\text{Habilitation}(y)]))$

Because every student had not wrote one Habilitation.

b) A conference chair organizes at least one event that is both research and public

$Chair \sqsubseteq \forall organizes.(Research \sqcap Public)$

$\forall x(\text{Chair}(x) \rightarrow \forall y[\text{organizes}(x, y) \wedge \text{Research}(y) \wedge \text{Public}(y)])$

True because every event is both research and public.

c) Each assistant is a university staff cannot teach in a privatissimum (exclusive tutorial)

$Assistant \sqsubseteq Staff \sqcap \forall teaches.(\neg Privatissimum)$

$\forall x(\text{Assistant}(x) \rightarrow \text{Staff}(x) \wedge \forall y[\text{teaches}(x, y) \wedge \neg\text{Privatissimum}(y)])$

False because every assistant is a staff but not a university stuff. And nobody can teach privatissimum that's right.

3. Decide if the user understood the ontological definitions correctly. Explain your answer.

a) $Customer \sqsubseteq PublicOrganization\ Customer \sqsubseteq Municipality$

$\forall x(\text{Customer}(x) \rightarrow \text{PublicOranization}(x) \wedge \text{Municipality}(x))$

A customer is both a public organization and municipality

That's true because only then it is satisfied.

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b) $GuestProfessor \sqsubseteq \neg\forall holds.\,(Lecture \sqcup Seminar)$

$\forall x(\text{GuestProfessor}\,(x) \rightarrow \neg\forall y[\text{holds}(x, y) \wedge (\text{Lecture}(y) \vee \text{Seminar}(y)])$

$\forall x(\text{GuestProfessor}\,(x) \rightarrow \exists y[\neg\text{holds}(x, y) \vee (\neg\text{Lecture}(y) \wedge \neg\text{Seminar}(y)])$

If someone holds a Lecture or a seminar then he/she is a guest professor.

False because there is a not before every y holds that's why he/she is not always a guest professor.

c) $Secretary \sqsubseteq UniEmployee\ UniEmployee \sqsubseteq \neg Secretary$

$\forall x(\text{Secretary}\,(x) \rightarrow \text{UniEmployee}(x)$

$\forall x(\text{UniEmployee}\,(x) \rightarrow \neg\text{Secretary}(x)$

All secretaries are university employee, but not every employee is a secretary

Not sure here!

Because the sentence is correct if you see it alone but if you combine both and you look at the truth table only secretary 0 and employee 0 or 1 is correct. So because of the not Secretary there can't be any secretary!