**Exercises sheet OWL/DL – Reasoning**

1. Translate the following axioms in to RDF Turtle

* 𝐻𝑢𝑚𝑎𝑛 ⊑ ¬𝐴𝑙𝑖𝑒𝑛

∀𝑥(Human (𝑥) → ¬Alien (𝑥) )

* 𝐹𝑎𝑡ℎ𝑒𝑟𝑊𝑖𝑡ℎ𝐷𝑎𝑢𝑔ℎ𝑡𝑒𝑟𝑠 ⊑ 𝑀𝑎𝑛 ⊓ ∀ℎ𝑎𝑠𝐶ℎ𝑖𝑙𝑑. 𝑊𝑜𝑚𝑎𝑛

∀𝑥(FatherWithDaughters (𝑥,y) → Man (𝑥) ∧ ∀y[hasChild(x, y) ∧ Woman(y)])

1. ex:FatherWithDaughters

  rdfs:subClassOf ex:Man;

  rdfs:subClassOf **[ owl:allValuesFrom ex:Woman ;**

**owl:onProperty    ex:hasChild**

**] .**

* 𝑆𝑖𝑏𝑙𝑖𝑛𝑔 ⊑ ∃𝑝𝑎𝑟𝑒𝑛𝑡. ∃ℎ𝑎𝑠𝐶ℎ𝑖𝑙𝑑. ¬𝑆𝑒𝑙𝑓

∀𝑥(Sibling (𝑥) → ∃y[parent(x, y) ∧ ∃z[hasChild(y, z) ∧ ¬Self(z)]])

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

a) Each Student had not wrote a habilitation

𝑆𝑡𝑢𝑑𝑒𝑛𝑡 ⊑ ¬(∃𝑤𝑟𝑜𝑡𝑒. 𝐻𝑎𝑏𝑖𝑙𝑖𝑡𝑎𝑡𝑖𝑜𝑛)

∀𝑥(Student (𝑥) → ¬(∃y[wrote(x, y) ∧ Habilitation(y)]))

Also: ∀𝑥(Student (𝑥) → (∀y[¬wrote(x, y) ∨ ¬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 ⊑ ∀𝑜𝑟𝑔𝑎𝑛𝑖𝑧𝑒𝑠. (𝑅𝑒𝑠𝑒𝑎𝑟𝑐ℎ ⊓ 𝑃𝑢𝑏𝑙𝑖𝑐)

∀𝑥(Chair (𝑥) → ∀y[organizes(x, y) ∧ Research(y) ∧ 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 ⊑ 𝑆𝑡𝑎𝑓𝑓 ⊓ ∀𝑡𝑒𝑎𝑐ℎ𝑒𝑠. (¬𝑃𝑟𝑖𝑣𝑎𝑡𝑖𝑠𝑠𝑖𝑚𝑢𝑚)

∀𝑥(Assistant (𝑥) → Staff(x) ∧ ∀y[teaches(x, y) ∧ ¬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 ⊑ 𝑃𝑢𝑏𝑙𝑖𝑐𝑂𝑟𝑔𝑎𝑛𝑖𝑧𝑎𝑡𝑖𝑜𝑛 𝐶𝑢𝑠𝑡𝑜𝑚𝑒𝑟 ⊑ 𝑀𝑢𝑛𝑖𝑐𝑖𝑝𝑎𝑙𝑖𝑡𝑦

∀𝑥(Customer (𝑥) → PublicOranization(x) ∧ Municipality(x))

A customer is both a public organization and municipality

That’s true because only then it is satisfied.

b) 𝐺𝑢𝑒𝑠𝑡𝑃𝑟𝑜𝑓𝑒𝑠𝑠𝑜𝑟 ⊑ ¬∀ℎ𝑜𝑙𝑑𝑠. (𝐿𝑒𝑐𝑡𝑢𝑟𝑒 ⊔ 𝑆𝑒𝑚𝑖𝑛𝑎𝑟)

∀𝑥(GuestProfessor (𝑥) → ¬∀y[holds(x, y) ∧ (Lecture(y) ∨ Seminar(y)])

∀𝑥(GuestProfessor (𝑥) → ∃y[¬holds(x, y) ∨ (¬Lecture(y) ∧ ¬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 ⊑ 𝑈𝑛𝑖𝐸𝑚𝑝𝑙𝑜𝑦𝑒𝑒 𝑈𝑛𝑖𝐸𝑚𝑝𝑙𝑜𝑦𝑒𝑒 ⊑ ¬𝑆𝑒𝑐𝑟𝑒𝑡𝑎𝑟𝑦

∀𝑥(Secretary (𝑥) → UniEmployee(x)

∀𝑥(UniEmployee (𝑥) → ¬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!