**ASSIGNMENT 10: DESCRIPTION LOGICS**

1. **My intention was for individual Jim to be classified as a resource. But is Jim a resource in every interpretation that satisfies axioms 1--8 and the four ABox assertions? Why or why not?**

Jim is not a resource in every interpretation that satisfies axioms 1--8 and the four ABox assertions. The (6) TBox axiom ∃*isMemberOf*.⊤ ⊑ *Person* restrict the domain

of *isMemberOf* to person, and the (7) axiom ⊤ ⊑ ∀*isMemberOf*.*Group* restrict its range to group. In combination with the ABox assertion *isMemberOf*(jim,helpdesk), these axioms would then allows us to deduce that Jim is a person and Helpdesk is a group. The (1) axiom ∃*supports*.*Activity* ⊑ *Resource* restrict the domain of *supports*.*Activity* to resource, and Abox assertions *Activity*(teaching) and *supports*(helpdesk, teaching) tells us that “helpdesk supports activity teaching.”, which we can deduce that helpdesk is a resource. So Jim cannot be classified as a resource.

1. **My TBox contains no assertions that the class of persons and the class of groups are disjoint. Are there enough other constraints to rule out the possibility that something could be both a person and a group?**

Even though the TBox contains no assertions that the class of persons and the class of groups are disjoint, there are not enough other constraints to rule out the possibility that something could be both a person and a group. From ∃*isMemberOf*.⊤ ⊑ *Person,* ⊤ ⊑ ∀*isMemberOf*.*Group, isMemberOf*(jim,helpdesk), we know that there can be only one person Jim be the member of helpdesk, in this case, Jim can be both a person and a group. If we have the axiom *Person* ⊓ *Group* ⊑ ⊥, then the set of person and the set of group are disjoint.

**3. Is Jim a physical object in any interpretation that satisfies all 12 assertions? Is**

Jim is not a physical object in any interpretation that satisfies all 12 assertions. *MaterialResource* ≡ *PhysicalObject* ⊓ *Resource, PhysicalObject*(laptop4), these are the only two assertions that gives us information on physical object. As we know, Jim is not a resource, and there is no assertion that indicates a person can or cannot be a physical object.

**4. Jim a person in every interpretation that satisfies all 12 assertions?**

Jim is a person in every interpretation that satisfies all 12 assertions. The (6) TBox axiom ∃*isMemberOf*.⊤ ⊑ *Person* restrict the domain of *isMemberOf* to person, and the (7) axiom ⊤ ⊑ ∀*isMemberOf*.*Group* restrict its range to group. In combination with the ABox assertion *isMemberOf*(jim,helpdesk), these axioms would then allows us to deduce that Jim is a person.

Axioms 1 through 8 are all that are asserted in the TBox of a description logic reasoning system.

1. ∃*supports*.*Activity* ⊑ *Resource*

**Individual that supports at least one activity is a resource.**

1. *GroupResource* ≡ *Group* ⊓ *Resource*

**GroupResource is the same as the set of individuals that are both Group and Resource.**

1. *HumanResource* ⊑ *Person*

**All HumanResources are Persons.**

1. *HumanResource* ⊑ *Resource*

**All HumanResources are Resources.**

1. ((∃*isMemberOf*.*GroupResource*) ⊔ (*Resource* ⊓ *Person*)) ⊑ *HumanResource*

**Either Individuals that is member of at least one groupresource or Individuals that are both Resource and Person are HumanResource.**

1. ∃*isMemberOf*.⊤ ⊑ *Person*

**All Individuals that is member of at least one individual are persons.**

1. ⊤ ⊑ ∀*isMemberOf*.*Group*

**Everybody are Individuals all of those is member of group.**

1. *MaterialResource* ≡ *PhysicalObject* ⊓ *Resource*

**MaterialResource is the set of individuals that are both physical object and resource.**

The ABox contains only the following assertions.

* *Activity*(teaching)

**Teaching is an instance of the concept Activity.**

**“Teaching is an activity.”**

* *supports*(helpdesk, teaching)

**Helpdesk is in the relation that is represented by supports to teaching.**

**“Helpdesk supports teaching.”**

* *isMemberOf*(jim,helpdesk)

**Jim is in the relation that is represented by isMemberOf to helpdesk.**

**“Jim is a member of helpdesk.”**

* *PhysicalObject*(laptop4)

**Laptop4 is an instance of the concept PhysicalObject.**

**“Laptop4 is a physical object.”**