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## 2-AIN-108: Labs #4 DL Conceptualization

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**Exercise 1.** Given  $N_C = \text{Person, Female}$  and  $N_R = \text{hasChild}$  define complex concepts:

- Male
- Parent
- Father
- Mother
- GrandParent
- GrandMother
- GrandFather
- MotherHavingOnlyDaughters

**Exercise 2.** Formalize following sentences as composite concepts:

- A man that is married to a doctor, and all of whose children are either doctors or professors.
- A man that likes only married women.
- A parent that has a child whose children are all married.

**Exercise 3.** Formalize following sentences as TBox axioms:

- Car engine is either diesel engine, petrol engine, electric engine, hybrid engine or steam engine.
- Vegetarians eat only vegetable.
- Vegan does not eat any animal product.
- Only humans can have human children.

**Exercise 4.** Prove following equivalences<sup>1</sup>:

1.  $\models C \sqcap \neg C \equiv \perp$
2.  $\models C \sqcup \neg C \equiv \top$
3.  $\models \neg\neg C \equiv C$
4.  $\models \neg(C \sqcup D) \equiv \neg C \sqcap \neg D$
5.  $\models \neg(C \sqcap D) \equiv \neg C \sqcup \neg D$

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<sup>1</sup>Hint: realize what does  $\models C \equiv D$  mean, apply interpretation rules for concept constructors and prove resulting set identities.