INVESTMENTS IN EDUCATION DEVELOPMENT

# 1 Description logic

**Exercise 1.1:** In description logics $\mathcal{AL}$ and $\mathcal{ALCN}$ with concepts `Male, Female` and a role `hasChild` define the following concepts

  a) `Person`

  b) `Mother, Father`

  c) `Parent`

  d) `Childless`

  e) `Grandmother, Grandfather`

  f) `ParentOfSons` (a parent with at least one son)

  g) `ParentOfOnlySons`

  h) `MotherWithManyChildren` (a mother with more then three children)

  i) `GrandmotherOfOnlyGrandsons`

**Exercise 1.2:** In description logic $\mathcal{ALC}$ with concepts `Male, Doctor, Rich, Famous` and roles `hasChild, hasFriend` define a popular textbook's concept `HappyFather`: "a father whose all children are doctors and all of the children have rich or famous friends".

**Exercise 1.3:** Prove or reject the following statements using tableaux in $\mathcal{ALC}$ description logic.

  a) $(\texttt{Person} \sqcap (\forall\texttt{hasChild.Male})) \sqsubseteq (\texttt{Person} \sqcap (\exists\texttt{hasChild.Male}))$

  b) $(\texttt{Male} \sqcap (\exists\texttt{hasChild.Male}) \sqcap (\forall\texttt{hasChild.Male})) \sqsubseteq$
    $((\texttt{Male} \sqcup \texttt{Female}) \sqcap (\exists\texttt{hasChild.}(\texttt{Male} \sqcup \texttt{Female})))$