Exercise Sheet 11
Due: January 23, 2009

Exercise 11.1 (Normal forms of structured specifications)
(a) Complete the proof that in a semi-exact institution, building normal forms preserves the model class (the cases of translation and hiding are missing).
(b) Does the result hold for weakly semi-exact institutions as well?

Exercise 11.2 (Subsorts)
Consider the following specification:

\[
\text{spec } sp1 =
\begin{align*}
\text{sorts } & \text{Man, Woman } < \text{Person} \\
\text{sort Hybrid } & < \text{Man} \\
\text{sort Hybrid } & < \text{Woman}
\end{align*}
\]

\[
\text{spec } sp2 =
\begin{align*}
\text{sorts } & \text{Man, Woman } < \text{Person} \\
\text{sorts Female } & < \text{Person} \\
\text{forall } p: \text{Person} \\
& . p \in \text{Woman } \Rightarrow p \in \text{Female} \\
& . p \in \text{Man } \Rightarrow \neg p \in \text{Female}
\end{align*}
\]

\[
\text{spec } sp = \{sp1 \text{ hide Hybrid}\} \text{ and } \{sp2 \text{ hide Female}\} \text{ end}
\]

(a) Use the semantics of structured specifications to argue that the model class of sp is empty (i.e., sp is inconsistent). Use the proof calculus for structured specifications to derive \( sp \vdash \bot \).
(b) Compute the normal form and prove that sp is inconsistent.
(c) Try out HETS. Extend the above specification by:

\[
\text{spec spimplies } = sp \\
\text{then } \%\text{implies} \\
& . \text{false}
\]

and then use “Edit -> Proofs -> TheoremHideShift” to compute the normal form.

The exercise sheets may and should be worked on in groups of two (2) students. Please write both names on your solution.