Automated Theorem Proving, SS 2014. Homework 2 (due April 3, 2014)

1.(a) Write the tables of the boolean functions corresponding to $\neg$, $\wedge$, $\vee$, $\Rightarrow$, $\Leftrightarrow$. Using them, determine the truth value of:

1.(b) The formula $(A \wedge (A \Rightarrow B)) \Rightarrow B$ under the interpretation $I = \{A \rightarrow \mathbb{T}, B \rightarrow \mathbb{F}\}$.

1.(c) The formula $(P \Rightarrow Q) \iff (\neg Q \Rightarrow \neg P)$ under the interpretation $I = \{P \rightarrow \mathbb{F}, Q \rightarrow \mathbb{F}\}$.

1.(d) The formula $((A \vee B) \Rightarrow C) \iff ((A \Rightarrow C) \wedge (B \Rightarrow C))$ under the interpretation $I = \{A \rightarrow \mathbb{T}, B \rightarrow \mathbb{T}, C \rightarrow \mathbb{F}\}$.

2. Is it possible to have a formula that is both in conjunctive and disjunctive normal form. If so, give 5 examples.

3. Give an example which shows that proving equivalence of two formulas by bringing them into conjunctive normal form is incomplete. By incompleteness, we mean that there are examples of formulas which are equivalent but their conjunctive normal form is not the same.

4. Show that proving validity of a formula by conjunctive normal form is complete. Give an example.

5. Show that proving unsatisfiability of a formula by disjunctive normal form is complete. Give an example.