

Exercise Sheet 02

(Logical Model)

Please note: The exercises will be neither collected, nor corrected, or graded.

Exercise 1 – General Questions

- Explain **unsatisfiable**, **satisfiable**, **universal**.
- What is a **model**? What is a **tautology**?
- What is a semantic **conclusion**? What is semantic **equivalence**?
- What is an **axiom**?
- What is a **clause**? What is a Horn **clause**?
- What is special about the **Herbrand interpretation**?

Exercise 2 – Proofs

- Prove using the introduced **Hilbert-style** proof system following statement.
 - $\vDash A \rightarrow A$
 - $\vDash A \rightarrow B \rightarrow (B \rightarrow C \rightarrow (A \rightarrow C))$
 - $\vDash B \rightarrow ((B \rightarrow A) \rightarrow A)$
- Can the following formulas be written **clauses**? If so, **provide** the corresponding clause. Is it also a Horn clause?
 - $A \rightarrow B \wedge C \rightarrow D$
 - $(A \vee B \vee C) \rightarrow D$
 - $\neg A \rightarrow (\neg B)$
 - $\neg A \rightarrow C$
 - $B \wedge (C \vee D)$
- Which of the following Hilbert interpretation for the language $\mathcal{L} := a, b, c, f, g, p, q$, is also a **Herbrand** model the formulas $\mathcal{W} := \{pa \rightarrow pb \wedge pb \rightarrow pc \rightarrow pa \rightarrow pc, (pa \rightarrow pb) \rightarrow (pb \rightarrow pa)\}$?
 - $I := \{pa \rightarrow pb, pb \rightarrow pc, pa \rightarrow pc\}$
 - $I := \{pa \rightarrow pb, pb \rightarrow pa\}$
 - $I := \{pa \rightarrow pb, pa \rightarrow pc\}$