192.067 VO Deductive Databases
January 28, 2021

	Matrikelnummer (student id)	Familienname (family name)	Vorname (first name)	

1.) Consider a program P consisting of the following rules:

$$
\begin{aligned}
a &\leftarrow \\
b &\leftarrow a, c \\
w &\leftarrow c, b \\
c &\leftarrow e \\
c &\leftarrow e, g \\
e &\leftarrow \\
g &\leftarrow c, f
\end{aligned}
$$

List all minimal models of P. Explain your answer. **(10 points)**

2.) Consider interpretations $I_1 = \{c, d\}$ and $I_2 = \{e, f\}$, and a program P consisting of the following rules:

$$e \leftarrow \mathit{not}\ c, \mathit{not}\ d$$
$$f \leftarrow \mathit{not}\ c, e$$
$$c \leftarrow \mathit{not}\ e$$

Compute the programs P^{I_1} and P^{I_2}, i.e. the reducts of P with respect to I_1, and with respect to I_2. Is I_1 a stable model of the program P? Is I_2 a stable model of the program P? Justify your answer. **(10 points)**

3.) Consider a program P consisting of the following rules:

$$d \leftarrow c$$
$$c \leftarrow not\ d$$
$$d \leftarrow not\ c$$

List all stable models of P. Justify your answer. **(10 points)**

4.) Consider an interpretation $\mathcal{I} = (\Delta^{\mathcal{I}}, \cdot^{\mathcal{I}})$ satisfying the following:

- $\Delta^{\mathcal{I}} = \{a, b, c\}$,
- $A^{\mathcal{I}} = \{b, c\}$ for the concept name A,
- $B^{\mathcal{I}} = \{a\}$ for the concept name B,
- $P^{\mathcal{I}} = \{(b, b), (a, b)\}$ for the role name P, and
- $R^{\mathcal{I}} = \{(a, a), (b, b)\}$ for the role name R.

Compute the extension of $\cdot^{\mathcal{I}}$ for the following complex concepts (i.e. compute $C^{\mathcal{I}}$ for all complex concepts C listed below):

(1) $B \sqcup \neg A$

(2) $(B \sqcup A) \sqcap \neg B$

(3) $\forall P.A$

(4) $\exists P.A$

(5) $\forall P.(B \sqcap \neg B)$

(6) $\exists R.(B \sqcup \neg B)$

(15 points)

5.) By defining a suitable interpretation, show that the concept $A \sqcap \neg(\forall R.A)$ is satisfiable. Here A is a concept name and R is a role name. **(15 points)**

Grading scheme: 0–31 nicht genügend, 32–38 genügend, 39–45 befriedigend, 46–52 gut, 53–60 sehr gut