

人工智能基础作业 6

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8.3 解: $\exists x, y \ x = y$ 是有效的;

对任意论域, 取 $x = y$, 或 $y = x$, 即可得到上式恒真, 所以有效;

8.6 解:

a. $(\exists x \ x = x) \Rightarrow (\forall y \exists z \ y = z)$ 是有效的;

如果 a 是有效的, 则前提为真时, 结论必定为真; 同时, 结论只需取 z 等于 y 本身即可成立, 因此是有效的;

b. $\forall x \ P(x) \vee \neg P(x)$ 是有效的;

对于任意 x , 谓词 $P(x)$ 要么为真, 要么为假, 所以上式恒真, 是有效的;

c. $\forall x \ Smart(x) \vee (x = x)$ 是有效的;

对于任意 x , $(x = x)$ 是真的, 所以上式是恒真的, 所以是有效的;

8.7 解:

a. (i) 不合语法所以无任何意义;

(ii) 真实表达了语句含义;

(iii) 符合语法但是并未表达出语句真实含义;

- b. (i) 真实表达了语句含义;
- (ii) 符合语法但是并未表达出语句真实含义;
- (iii) 不合语法所以无任何意义;
- (iv) 不合语法所以无任何意义;
- c. (i) 真实表达了语句含义;
- (ii) 真实表达了语句含义;
- (iii) 符合语法但是并未表达出语句真实含义;
- (iv) 符合语法但是并未表达出语句真实含义;
- d. (i) 真实表达了语句含义;
- (ii) 真实表达了语句含义;
- (iii) 符合语法但是并未表达出语句真实含义;
- (iv) 真实表达了语句含义;
- e. (i) 真实表达了语句含义;
- (ii) 符合语法但是并未表达出语句真实含义;
- (iii) 符合语法但是并未表达出语句真实含义;
- (iv) 不合语法所以无任何意义;

8.10 解:

a. $(\text{Occupation}(\text{Emily}, \text{Doctor}) \wedge \text{Occupation}(\text{Emily}, \text{Lawyer})) \vee$

$(\text{Occupation}(\text{Emily}, \text{Doctor}) \wedge \text{Occupation}(\text{Emily}, \text{Lawyer}));$

b. $\text{Occupation}(\text{Joe}, \text{Actor}) \wedge ((\text{Occupation}(\text{Joe}, \text{Doctor}) \vee$

$(\text{Occupation}(\text{Joe}, \text{Surgeon}) \vee (\text{Occupation}(\text{Joe}, \text{Lawyer})));$

c. $\forall x \text{Occupation}(x, \text{Surgeon}) \Rightarrow \text{Occupation}(x, \text{Doctor});$

d. $\forall x \text{Occupation}(x, \text{Lawyer}) \Rightarrow \neg \text{Customer}(\text{Joe}, x);$

e. $\exists x \text{Boss}(x, \text{Emily}) \wedge (\text{Occupation}(x, \text{Lawyer});$

f. $\exists x \forall y (\text{Occupation}(x, \text{Lawyer}) \wedge \text{Customer}(y, x) \Rightarrow (\text{Occupation}(y, \text{Doctor});$

g. $\forall x \exists y (\text{Occupation}(x, \text{Surgeon}) \Rightarrow (\text{Occupation}(y, \text{Lawyer}) \wedge \text{Customer}(x, y);$

8.11 解:

a. any two people who speak the same language can understand each other well;

b. 如果 a 为真, 则 a 的结论必定为真, 所以 $\text{Understand}(x, y)$ 为真且 $\text{Understand}(y, x)$ 也为真, 所以 b 为真, 所以可以导出 b;

c. (i) $\exists x \exists y \text{Understand}(x, y) \wedge \text{Understand}(y, x) \Rightarrow \text{Friendship}(x, y);$

(ii) $\forall x \forall y \forall z \text{Friendship}(x, y) \wedge \text{Friendship}(y, z) \Rightarrow \text{Friendship}(x, z);$