Logic Self-Assessment Test

Artificial Intelligence, AY 2015/2016, UNIZG FER

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1. Abduction is not a sound rule of inference because it is *not* the case that:
   (a) $A \rightarrow B, A \vDash B$
   (b) $A \rightarrow B, B \rightarrow C \vDash A \rightarrow C$
   (c) $A \vDash A \wedge B$
   (d) $A \rightarrow B, B \vDash A$
2. If $F \equiv G$ hold, then it must be the case that:
   (a) $\vDash G$
   (b) $\vdash F$
   (c) $G \vdash F$
   (d) $G \vDash F$
3. Formula $F \vee \neg G$ is:
   (a) satisfiable
   (b) valid
   (c) inconsistent
   (d) syntactically ill-formed
4. We are given the following facts: *Unicorn is immortal (I), if it is a mythical creature (C). If unicorn is immortal or an ordinary mortal animal (A), then it is horned (H). As soon as unicorn is horned, it is magical (M). But, if it is not immortal, then it is an ordinary mortal animal.* Which of the following *cannot* be proven?
   (a) *If unicorn is not an ordinary mortal animal, then it is immortal.*
   (b) *If unicorn is horned, then unicorn is horned.*
   (c) *Unicorn is magical.*
   (d) *Unicorn is a mythical creature.*
5. Which of the following FOL formulae is *interpretable*?
   (a) $\forall x \forall y P(x, y)$
   (b) $\Big(P(a, x) \leftrightarrow Q(y)\Big)$
   (c) $P(x, y) \wedge \Big(Q(x) \wedge Q(y)\Big)$

(d) $\forall x P(x, y)$

6. Which of the following formulae is *not* a well-formed formula of FOL?

   (a) $\forall x \exists y \Big(P(f(x), y) \land Q(y) \Big)$

   (b) $\forall x \Big(ODD(x \lor add(x + 1)) \Big)$

   (c) $P(x) \rightarrow \forall x Q(x)$

   (d) $\forall x P(x, y) \land \Big(Q(x) \land Q(y) \Big)$

7. FOL formula $\forall x(P(x) \land \neg P(x))$ is:

   (a) inconsistent

   (b) non-interpretable

   (c) not wff

   (d) valid

8. We are given an interpretation with a domain $D = \{a, b\}$ and an extension $P(a) \equiv \top$. This interpretation is a *model* of:

   (a) $\exists x P(x) \rightarrow \forall x P(x)$

   (b) $\exists x P(x) \rightarrow P(b)$

   (c) $P(b) \rightarrow \forall x P(x)$

   (d) $\forall x P(x) \leftrightarrow P(a)$

9. What is the correct formalization of *"Ann doesn't like any animal"* in FOL?

   (a) $\neg LIKE(Ann, Animal)$

   (b) $\neg \forall animal\, LIKE(Ann, animal)$

   (c) $\neg \forall x \Big(ANIMAL(x) \land LIKE(Ann, x) \Big)$

   (d) $\forall x \Big(ANIMAL(x) \rightarrow \neg LIKE(Ann, x) \Big)$

10. Let $W(x)$ denote "x is a word", $P(x)$ denote "x is pleasant" and $T(x)$ denote "x is truthful". Which of the following FOL formulas represents the statement *"Pleasant words need not be truthful"*?

    (a) $\forall x \Big((W(x) \land \neg P(x)) \rightarrow \neg T(x) \Big)$

    (b) $\exists x \neg \Big((W(x) \land T(x)) \rightarrow P(x) \Big)$

    (c) $\exists x \Big(W(x) \land T(x) \land \neg P(x) \Big)$

    (d) $\exists x \Big(W(x) \land P(x) \land \neg T(x) \Big)$

Answers

1. D
2. D
3. A
4. D
5. A
6. B
7. A
8. C
9. D
10. D