

COMP3411/9814

23T1

QUIZ 4

Question 1

Consider these two sentences on three proposition symbols K, L, M

(i) $L \rightarrow K \wedge \neg M$

(ii) $\neg M \wedge \neg L \rightarrow K$

What is the full list of models that satisfy both of these sentences?

- ☐ $\{\}, \{L\}, \{L, M\}, \{K, L, M\}$
- ☐ $\{K\}, \{M\}, \{K, L\}$
- ☐ $\{K\}, \{K, L\}, \{K, M\}$
- ☒ $\{K\}, \{M\}, \{K, L\}, \{K, M\}$

Question 2

Which of the following does not represent “You won’t pass the exam unless you study” where S is “you study” and P is “you pass the exam”?

- ☒ $S \Rightarrow P$
- ☐ $P \Rightarrow S$
- ☐ $\neg S \Rightarrow \neg P$
- ☐ $\neg(P \wedge \neg S)$

Question 3

☒ Which expression is logically equivalent to the sentence:

"Every clown rides a big, red bicycle"

- ☐ $\forall c \exists b \text{ Clown}(c) \wedge \text{Big}(b) \wedge \text{Red}(b) \wedge \text{Bicycle}(b) \wedge \text{Rides}(c, b)$
- ☐ $\exists b \forall c \text{ Clown}(c) \wedge \text{Big}(b) \wedge \text{Red}(b) \wedge \text{Bicycle}(b) \wedge \text{Rides}(c, b)$
- ☒ $\forall c \exists b \text{ Clown}(c) \rightarrow \text{Big}(b) \wedge \text{Red}(b) \wedge \text{Bicycle}(b) \wedge \text{Rides}(c, b)$
- ☐ $\forall c \forall b \text{ Clown}(c) \rightarrow \text{Big}(b) \wedge \text{Red}(b) \wedge \text{Bicycle}(b) \wedge \text{Rides}(c, b)$

Question 4

Consider this knowledge base:

$$\{A \vee B, \neg A \vee C \vee D, B \vee \neg C, \neg B \vee \neg D\}$$

Which of the following is a valid resolution from this knowledge base?

☐

$$\begin{array}{cc} A \vee B & \neg A \vee C \vee D \\ & \searrow \swarrow \\ & B \wedge C \wedge D \end{array}$$

☐

$$\begin{array}{cc} A \vee B & B \vee \neg C \\ & \searrow \swarrow \\ & A \vee \neg C \end{array}$$

☒

$$\begin{array}{cc} \neg A \vee C \vee D & B \vee \neg C \\ & \searrow \swarrow \\ & \neg A \vee B \vee D \end{array}$$

Question 5

What is the clausal form of $\neg\exists x\exists y (animal(x) \wedge plant(y) \wedge eats(x, y))$

Here c and d are Skolem constants.

- ☐ $\{animal(x) \vee \neg plant(y) \vee \neg eats(x, y)\}$
- ☐ $\{animal(x), plant(y), eats(x, y)\}$
- ☒ $\{\neg animal(x) \vee \neg plant(y) \vee \neg eats(x, y)\}$
- ☐ $\{animal(c), plant(d), eats(c)\}$