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sk9275245@gmail.com ▼

Courses » AI:Knowledge Representation and Reasoning

Announcements

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Unit 4 - Week 2 : Propositional Logic

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Assignment 2

The due date for submitting this assignment has passed. **Due on 2019-02-13, 23:59 IST.**

Assignment submitted on 2019-02-13, 23:58 IST

1) 1 point
A rule of inference is sound if it is based on a tautological implication. Which of the following is a sound rule of inference?

- ☒ $(\neg Q \wedge (P \rightarrow Q)) \rightarrow \neg P$
- ☐ $((P \vee Q) \wedge \neg P) \rightarrow \neg Q$
- ☐ $\neg P \rightarrow (P \vee Q)$
- ☒ $((P \rightarrow Q) \wedge (S \rightarrow T) \wedge (P \vee S)) \rightarrow (Q \vee T)$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$(\neg Q \wedge (P \rightarrow Q)) \rightarrow \neg P$

$((P \rightarrow Q) \wedge (S \rightarrow T) \wedge (P \vee S)) \rightarrow (Q \vee T)$

2) 1 point
A knowledge base consists of the following 3 premises:

$(P \vee Q) \rightarrow R, \neg Q, \neg R$

Given below is a sequence of steps to derive $\neg P$ from the knowledge base.

1. $(P \vee Q) \rightarrow R$
2. $\neg R$
3. $\neg(P \vee Q)$
4. $\neg P \wedge \neg Q$
5. $\neg P$

Which of the following sequences is a correct justification for the above derivation?

- ☐ Premise, Premise, Modus Ponens (1,2), De Morgan's law (3), Simplification(4)
- ☐ Premise, Premise, Modus Tollens (1,2), De Morgan's law (3), Addition(4)
- ☒ Premise, Premise, Modus Tollens (1,2), De Morgan's law (3), Simplification (4)
- ☐ Premise, Premise, Modus Ponens (1,2), Premise, Addition(4)

Yes, the answer is correct.

Score: 1

Accepted Answers:

Premise, Premise, Modus Tollens (1,2), De Morgan's law (3), Simplification (4)

- 3) Consider the two clauses $(P \vee Q)$ and $(\neg P \vee \neg Q)$. Which of the following is/are the clause(s) generated as a result of resolution? 1 point

- ☐ {}
☒ $(P \vee \neg P)$
☒ $(Q \vee \neg Q)$
☐ \top
☐ Cannot be resolved

Partially Correct.

Score: 0.66

Accepted Answers:

$(P \vee \neg P)$

$(Q \vee \neg Q)$

\top

- 4) Which of the following are equivalent? 1 point

i. $\neg P \vee Q$

ii. $P \rightarrow Q$

iii. $\neg P \rightarrow \neg Q$

iv. $\neg Q \rightarrow \neg P$

v. $Q \rightarrow P$

- ☒ (iii) and (v)
☒ (i) and (ii)
☒ (ii) and (iv)
☒ (i) and (iv)
☐ (iii) and (iv)
☐ All are equivalent

Yes, the answer is correct.

Score: 1

Accepted Answers:

(iii) and (v)

(i) and (ii)

(ii) and (iv)

(i) and (iv)

- 5) Is the following a valid proof for S given the premises: P , $P \rightarrow \neg Q$, $R \rightarrow Q$, R ? 1 point

1. P
2. $P \rightarrow \neg Q$
3. $\neg Q$ (1, 2, Modus Ponens)
4. $\neg Q \vee S$ (3, Addition)
5. R
6. $R \rightarrow Q$
7. Q (5, 6, Modus Ponens)
8. S (4, 7, Disjunctive Syllogism)

- ☒ The proof is valid.
☐ The proof is not valid as KB is inconsistent.
☐ The proof is valid as one can derive anything from an inconsistent KB.
☐ None of the above.

No, the answer is incorrect.

Score: 0

Accepted Answers:

The proof is valid as one can derive anything from an inconsistent KB.

6)

1 point

Which operation(s) 'op' is/are equivalent to $(P \text{ op } Q)$ defined below?

P	Q	$(P \text{ op } Q)$
False	False	True
False	True	True
True	False	False
True	True	True

- ☐ $P \vee \neg Q$
☒ $\neg P \vee Q$
☒ $P \rightarrow Q$
☒ $\neg Q \rightarrow \neg P$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$\neg P \vee Q$
 $P \rightarrow Q$
 $\neg Q \rightarrow \neg P$

7)

1 point

Which of the following set of boolean operators is/are **functionally complete**?

HINT: A **functionally complete** set of logical connectives or Boolean operators is one which can be used to express all possible truth tables by combining members of the set into a Boolean expression.

- ☒ {NOT, AND}
☒ {NAND}
☐ {NOT, AND, OR}
☒ {NOR}

Partially Correct.

Score: 0.75

Accepted Answers:

$\{NOT, AND\}$
 $\{NAND\}$
 $\{NOT, AND, OR\}$
 $\{NOR\}$

8)

1 point

i. Socrates is a man.

ii. All men are mortal.

Given the above two premises, can we derive 'Socrates is mortal' in propositional logic?

- ☐ Yes
☒ No

Yes, the answer is correct.

Score: 1

Accepted Answers:

No

9) Given the following set of clauses:

1 point

1. $P \vee \neg Q$
2. $\neg P \vee \neg S \vee \neg R$
3. $S \vee T \vee \neg P$
4. $\neg Q \vee R$
5. $\neg T \vee Q$
6. $R \vee \neg S \vee \neg Q$

Which of the following pairs can be **resolved** together?

- ☐ 1, 2
- ☐ 1, 4
- ☐ 3, 5
- ☐ 4, 6
- ☐ 2, 5
- ☐ 2, 6
- ☐ 1, 6
- ☐ 4, 5
- ☐ 1, 5

No, the answer is incorrect.**Score: 0****Accepted Answers:**

1, 2
 3, 5
 4, 5
 1, 5

10)

1 point

In the course introduction video, there were two arguments

A1: If the earth were spherical, it would cast curved shadows on the moon. It casts curved shadows on the moon. So, it must be spherical.

A2: If he used good bait (G) and the fish weren't smarter ($\neg S$) than he was, then he didn't go hungry ($\neg H$). But he used good bait (G) and he did go hungry (H), so the fish must've been smarter (S) than he was.

- ☐ A1 is a valid argument but not A2
- ☐ A2 is a valid argument but not A1
- ☒ Both A1 and A2 are valid arguments
- ☐ None of A1 and A2 is a valid argument

No, the answer is incorrect.**Score: 0****Accepted Answers:***A2 is a valid argument but not A1*

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