MATH / CS 11 Q1 - Open questions

Kunal Shrivastav

TOTAL POINTS

5 / 8

QUESTION 1

Questions 5 & 6 2 pts

1.1 5 **2 / 2**

1.2 6 **0 / 0**

QUESTION 2

2 Question 7 **3 / 3**

QUESTION 3

3 Question 8 **0 / 3**

- 1 *Point adjustment*

Name: Kunal Shrivastav

Quiz 1 - V2

Math/CS 11

Wednesday, April 26, 2023

The quiz is out of 14 points. It is to be solved individually. You are not allowed to use any materials, notes, or technology to solve it.

Multiple choice

Consider the propositions W = "it is winter" and S = "it snows."

1. (1 point) What is the logical proposition formalizing the statement "It only snows in winter."

   (a) $S \leftrightarrow W$

   (b) $W \vee S$

   (c) $S \rightarrow W$

   (d) $W \rightarrow S$

2. (1 point) Let p and q be logical propositions. Which of the following propositions is equivalent to $\neg(p \oplus q)$.

   (a) $p \leftrightarrow q$

   (b) $(\neg p) \oplus (\neg q)$

   (c) $p \rightarrow (p \vee q)$

   (d) $p \rightarrow (p \wedge q)$

p	q	$p \oplus q$	$\neg(p \oplus q)$
T	T	F	T
T	F	T	F
F	T	T	F
F	F	F	T

Consider the following setting. Our domain is the set of all horses, $P(x, y)$ = "x plays with y", d is the horse named Dee, and $N(x)$ = "x is nice". Which of the propositions (a) – (d) correspond to each of the sentences:

3. (1 point) All nice horses play with Dee. $\forall x \quad N(x) = \text{nice}$

   nice $\rightarrow x$ plays with y.

4. (1 point) There is a nice horse that plays with Dee.

   $\exists x, N(x)$ & play with y

   (a) $\forall x, [N(x) \wedge P(x, d)]$

   (b) $\forall x, [N(x) \rightarrow P(x, d)]$

   (c) $\exists x, [N(x) \wedge P(x, d)]$

   (d) $\exists x, [N(x) \rightarrow P(x, d)]$

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Open questions

Consider the propositions W = "it is winter" and S = "it snows".

5. (2 points) Give an English sentence *without using negations* that concisely describes the meaning of the compound proposition

$$\neg(\neg W \vee \neg S).$$

$\neg(\neg W \vee \neg S) = \neg(\neg W \wedge \neg S)$ ← De Morgan's Law

$= W \wedge S$

= It is winter and it snows.

6. (2 points) Give an English sentence *without using negations* that concisely describes the meaning of the compound proposition

$$\neg(\neg S \to W).$$

S	W	¬S→W	¬(¬S→W)
T	T	T	F
T	F	T	F
F	T	T	F
F	F	F	T

$\neg(\neg S \to W) \equiv \neg(S \vee \neg W)$ ← DML

≡ It is not snowing and it is not winter

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Consider the following information about a computer program:

- There is an undeclared variable or there is a syntax error in the first five lines.
- If there is a syntax error in the first five lines, then there is a missing semicolon or a variable name is misspelled.
- There is not a missing semicolon.
- There is not a misspelled variable name.

7. (3 points) Rewrite the previous information using only logical variables and logical operators.

p = undeclared variable

There is { q = syntax error in first 5 lines
r = missing semicolon
s = misspelled variable name

a) $p \vee q$

b) $q \rightarrow (r \vee s)$

c) $\neg r$

d) $\neg s$

8. (3 points) Find what is the mistake in the program. Explain your reasoning.

A mistake is made when p, q, r, or s is true

$\Rightarrow$ if p is F, then q is T. This means that $T \rightarrow (r \vee s)$, so either r or s is T, meaning either r or s is T. If r is F, then s is T, so the mistake is that there is a misspelled variable name or a missing semicolon