Quiz 1

Student

Zixuan Chen

Total Points

20 / 20 pts

Question 1

(no title)   **4** / 4 pts

1.1 ├─ **(no title)**   **2** / 2 pts

  ✔ **+ 2 pts** Correct

    + 0 pts Incorrect

1.2 ─ **(no title)**   **2** / 2 pts

  ✔ **+ 2 pts** Correct

    + 0 pts Incorrect

Question 2

(no title)   **4** / 4 pts

2.1 ├─ **(no title)**   **1** / 1 pt

  ✔ **+ 1 pt** Correct

    + 0 pts Incorrect

2.2 ├─ **(no title)**   **1** / 1 pt

  ✔ **+ 1 pt** Correct

    + 0 pts Incorrect

2.3 ├─ **(no title)**   **1** / 1 pt

  ✔ **+ 1 pt** Correct

    + 0 pts Incorrect

2.4 ─ **(no title)**   **1** / 1 pt

  ✔ **+ 1 pt** Correct

    + 0 pts Incorrect

Question 3

(no title)   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

Question 4

(no title)   **2** / 2 pts

4.1 ⌐ **(no title)**   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

4.2 ⌐ **(no title)**   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

Question 5

(no title)   **4** / 4 pts

5.1 ⌐ **(no title)**   **2** / 2 pts

✔ **+ 2 pts** Correct

+ 0 pts Incorrect

5.2 ⌐ **(no title)**   **2** / 2 pts

✔ **+ 2 pts** Correct

+ 0 pts Incorrect

Question 6

(no title)   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

Question 7

(no title)   **4** / 4 pts

7.1   **(no title)**   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

7.2   **(no title)**   **1** / 1 pt

+ 0 pts Incorrect

✔ **+ 1 pt** Correct

7.3   **(no title)**   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

7.4   **(no title)**   **1** / 1 pt

✔ **+ 1 pt** Correct

+ 0 pts Incorrect

Question 8

(no title)   **0** / 0 pts

✔ **+ 0 pts** Correct

+ 0 pts Incorrect

Q1
4 Points

The **domain** of discourse are **all the people in the world**. Given the predicates:

S(x): x is a student in CS40
T(x): x studied for the test
A(x): x received an A

Write the logical expression that is equivalent to:

Q1.1
2 Points

"Every student in CS40 who received an A studied for the test."

$$\forall x(S(x) \wedge A(x) \rightarrow T(x))$$

Q1.2
2 Points

"Each student in CS40 received an A only if they studied for the test."

$$\forall x(S(x) \rightarrow (A(x) \rightarrow T(x)))$$

Q2
4 Points

Given the propositions s and m, answer the questions below

Q2.1
1 Point

Select all possible truth values for s and m that make the compound proposition $(s \wedge m) \to \neg s$ evaluate to **False**

- [ ] None of the above
- [ ] TF
- [ ] FF
- [x] TT
- [ ] FT

Q2.2
1 Point

Express the proposition $s \wedge m$ only using the operators $\neg$ and $\to$

$$\neg(s \to \neg m)$$

Q2.3
1 Point

Express the proposition $s \vee m$ only using the operators $\neg, \wedge$

$$\neg(\neg s \wedge \neg m)$$

Q2.4
1 Point

Express the proposition $s \leftrightarrow m$ only using the operators $\neg$, $\vee$

$$\neg(\neg(\neg s \vee m) \vee \neg(\neg m \vee s))$$

Q3
1 Point

The propositional variables f and p represent the following two propositions:

f: I am your friend.
p: You give me presents.

Select the logical expression that represents the statement:

"I am your friend whether or not you give me presents"

- ⦿ $(p \rightarrow f) \wedge (\neg p \rightarrow f)$
- ◯ $f \vee p \vee \neg p$
- ◯ $p \rightarrow f$
- ◯ $f \leftrightarrow p$
- ◯ $\neg p \rightarrow f$

Q4

2 Points

Suppose $P(x)$ and $Q(x)$ are predicates over the domain $\{1, 2, 3\}$.

Q4.1

1 Point

Select the quantified statement expression that is equivalent to the compound proposition:

$\neg(P(1) \wedge P(2) \wedge P(3))$

- ○ $\exists x P(x)$
- ○ $\forall x P(x)$
- ◉ $\exists x \neg P(x)$
- ○ $\neg \exists x P(x)$

Q4.2

1 Point

Select the quantified statement expression that is equivalent to the compound proposition given below:

$$(\neg P(1) \vee Q(1)) \wedge (\neg P(2) \vee Q(2)) \wedge (\neg P(3) \vee Q(3))$$

- ○ $\forall x \neg P(x) \vee \forall x Q(x)$
- ○ $\forall x P(x) \rightarrow \forall x Q(x)$
- ◉ $\forall x (P(x) \rightarrow Q(x))$
- ○ $\exists x (P(x) \wedge \neg Q(x))$

Q5
4 Points

Consider the proposition

$$\phi = \forall x \exists y \forall z (\ (\ (x \neq y) \wedge B(x,y)\ ) \wedge (\ (y \neq z) \rightarrow \neg B(x,z)\ )\ )$$

Q5.1
2 Points

Which of the following propositions is logically equivalent to ϕ? SELECT ALL THAT APPLY

- [ ] $\forall x \exists y \forall z (\ (x \neq y) \wedge B(x,y) \wedge (y \neq z) \wedge \neg B(x,z)\ )$

- [x] $\forall x \exists y (\ ((x \neq y) \wedge B(x,y)) \wedge \neg \exists z (\ (y \neq z) \wedge B(x,z)\ )\ )$

- [ ] $\exists y \forall x \forall z (\ (\ (x \neq y) \wedge B(x,y)\ ) \wedge (\ (y \neq z) \rightarrow \neg B(x,z)\ )\ )$

- [x] $\forall x \exists y \forall z (\ (\ (x \neq y) \wedge B(x,y)\ ) \wedge (\ (y = z)) \vee \neg B(x,z)\ )\ )$

Q5.2
2 Points

Let $B(x,y)$ be the statement "y is the best friend of x". Translate proposition ϕ to English.

> for any person x, there exists a different person y that y is the best friend of x and for any other person z, if z and y are not the same person, then z is not the best friend of x.

Q6

1 Point

Your task: Out of the arguments below, select the invalid one. H_i means Hypothesis i, C means conclusion.

- ● $H_1 : p \rightarrow q \; H_2 : p \vee q. \; C : p$
- ○ $H_1 : p \; H_2 : q. \; C : p \vee q$
- ○ $H_1 : p \leftrightarrow q \; H_2 : p \vee q. \; C : p$
- ○ $H_1 : p \vee q \; H_2 : \neg q. \; C : p \wedge \neg q$

Q7

4 Points

You are given the proposition $\phi = ((p \to q) \land (q \to r)) \to (q \to r)$, where p and q and r are atomic propositions. Select whether each of the following statements about proposition ϕ is True or False

Q7.1

1 Point

ϕ is a tautology

◉ True

○ False

Q7.2

1 Point

$\neg\phi$ is a tautology

○ True

◉ False

Q7.3

1 Point

$\phi \land \neg\phi$ is a contradiction

○ False

◉ True

Q7.4
1 Point

$\phi \vee \neg\phi$ is a tautology

◉ True

○ False

Q8
0 Points

Note about typing out your responses.

You may write your responses in LaTex format and put it within the double dollar delimiters. For example by writing

$$ \forall x \in \mathbb{Z} $$

your answer should appear in LaTeX format as below:

$$\forall x \in \mathbb{Z}$$

Here is a quick guide to LaTeX symbols that will be relevant for this quiz:
https://docs.google.com/document/d/17SWkubtX4UQhU2U4Bu1F9jhzWk2RMemNUf16e3-Dk30/edit?usp=sharing

You may also write your responses out in an editor of your choice and then copy paste them in the spaces provided

Integrity reminder:
Solve the problems for this quiz individually – collaboration is **not** allowed. You may use course materials (textbook, your notes, materials). You are **not** allowed to use the internet for any other purpose than to access/submit the quiz, and access the course materials. No Googling!

You need to take the quiz in person during section - attendance will be taken.

Do not make public posts about the quiz on Piazza.

Any instances of academic dishonesty will be reported as specified in the course syllabus and will result in being downgraded by at least one letter grade in the course.

◉ Check this box to indicate that you understand the academic integrity policy for the quiz.