

Quiz # 02

Course Name	Discrete Structure	Semester	Spring 2024
Total Time	20 mins	Total Marks	10
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[CLO-1] Question: 01 [2]

1. Let $Q(x, y)$ be the statement " $x+y = x-y$ ". If the universe of discourse for both variables is the set of integers, what are the truth values of the following?

- a) $Q(1, 1)$
- b) $\exists x Q(x, 2)$

Prove your answers.

Solution:

- a) $1 + 1 = 1 - 1$ — False.
- c) $\exists x x + 2 = x - 2$ — False, because the equality is equivalent to $2 = -2$.
y.

2. $Q(x): x < 2$. What is the truth value of $\forall x Q(x)$ in the domain of real numbers?

Solution:

Find a counterexample for $\forall x Q(x)$

$Q(3): 3 < 2$ is false

$x=3$ is a counterexample for $\forall x Q(x)$, so $\forall x Q(x)$ is false.

[CLO-1] Question: 02 [2]

Prove that if n is a perfect square, then $n + 2$ is not a perfect square.

Solution:

. Let $n = m^2$, If $m = 0$, then $n + 2 = 2$, which is not a perfect square, so we can assume that $m \geq 1$. The smallest perfect square greater than n is $(m + 1)^2$, and we have $(m + 1)^2 = m^2 + 2m + 1 = n + 2m + 1 > n + 2 \cdot 1 + 1 > n + 2$. Therefore $n + 2$ cannot be a perfect square.

[CLO-1] Question: 03 [2]

What is the negation of the statement “There is an honest politician”? (by using Negating quantified expression).

Solution:

Determine individual propositional function

$P(x)$: x is an honest politician.

Then translate the sentence into logical expression

$\exists x P(x)$ domain: politicians

Find the negation of $\exists x P(x)$

$\forall x \neg P(x)$ domain: politicians

Translate $\forall x \neg P(x)$ into English sentence

Every politician is dishonest.

[CLO-1] Question: 04 [2]

Find the argument form for the following argument and determine whether it is valid. Can we conclude that the conclusion is true if the premises are true?

If George does not have eight legs, then he is not a spider.

George is a spider.

\therefore George has eight legs.

Solution:

This is modus tollens. The first statement is $p \rightarrow q$, where p is “George does not have eight legs” and q is “George is not a spider.” The second statement is $\neg q$. The third is $\neg p$. Modus tollens is valid. We can therefore conclude that the conclusion of the argument (third statement) is true, given that the hypotheses (the first two statements) are true

[CLO-1] Question: 05 [2]

Decide if the following arguments are valid or invalid. State the Rule of Inference of fallacy used.

(a) If it snow, then school is closed.

School is open.

Therefore it is not snowing.

(b) My pet is a cat or my pet is a dog.

My pet is not dog.

Therefore my pet is a cat.

(c) If the movie is long, I will fall Asleep.

I do fall asleep

Therefore the movie was long.

Solution:

(a) VALID, Modus Tollens

(b) VALID, Elimination

(c) INVALID, Converse Error

