2301 COL 202 Tutorial 2.3

Abhinav Rajesh Shripad

QUESTION 1

1 Problem 3 **2 / 2**

   ✓ **- 0 pts** *Correct*

    - 0.25 pts Need to also mention, if the statement holds for $\forall x$ or for some x ($\exists x$)

    - 0.5 pts (d) Part incorrect

    From (b), for some x, we have $R(x)$ and $\neg Q(x)$. By contrapositive of (a), we have $\neg Q(x) \implies \neg P(x) \forall x$. Thus as we know $\neg Q(x)$ holds, $\neg P(x)$ is also true. $R(x)$ and $\neg P(x)$ are simultaneously true, when (a) and (b) hold. Thus (c) follows from (a) and (b)

    - 0.25 pts (b) using $\implies$ is incorrect

    - 0.25 pts (c) using $\implies$ is incorrect

    - 0.25 pts (d) part correct, but no explanation provided

    💬 Nice! Thanks for using LATEX

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COL 202 Assignment 2

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1 Problem Statement

Let $P(x), Q(x)$, and $R(x)$ be the statements "x is a clear explanation", "x is satisfactory", and "x is an excuse", respectively. Suppose that the domain for x consists of all English text. Express each of these statements using quantifiers, logical connectives, and $P(x), Q(x)$ and $R(x)$.
(a) All clear explanations are satisfactory.
(b) Some excuses are unsatisfactory.
(c) Some excuses are not clear explanations.
(d) Does (c) follow from (a) and (b)?

2 Solution

2.1

$P(x) \Rightarrow Q(x)$ is a tautology.
Whenever $P(x)$ is true, $Q(x)$ must be true,thus the above proposition is a tautology.

2.2

$\exists$ x, such that $R(x) \wedge \neg Q(x)$ is true.

2.3

$\exists$ x,such that $R(x) \wedge \neg P(x)$ is true.

2.4

We prove that (c) follows from (a) and (b) by providing a constructive proof.

Since (b) is true, there exists a x such that $R(x)$ is true and $Q(x)$ is false. Since (a) is a tautology, for this particular x, $Q(x)$ is false and thus for for this x $P(x)$ must also be false. Thus for this x, $R(x) \wedge \neg P(x)$ is true. Hence there exists a x such that $R(x) \wedge \neg P(x)$ is true. Thus (c) follows from (a) and (b).