Quiz 1, Section 2, MSK1: CSE 173, Spring 2022, NSU

Directions: Straight zero to any questions if any two copies appear structurally similar (same answer style, but the texts are different only). Copying materials from online and offline sources **is strictly prohibited.** Failure to adhere to the stated directions **will result in zero** in your Quiz 1.

Submit your answers as **a single PDF (hand-written)** document. Your earned score will also depend on how neatly and coherently you represent the required information.

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1 Question 1: 5 Points

Use all the premises and apply rules of inference to show that the premises (comma separated): $(p \wedge t) \rightarrow (r \vee s)$, $q \rightarrow (u \wedge t)$, $u \rightarrow p$, $\neg s$, q lead to conclusion r

2 Question 2: 4 + 3 + 4 + 5 Points

Answer the questions with justification whenever needed.

(a) Suppose, five of you are acting as the members of a committee formed by your university. You have the right to vote in favor or in against any law passed by your university. Provide a logical expression that always ensures that any four of you vote against a law and the other member vote in favor of the law.

(b) Quantify if the below statements are True or False. Show your justification using an example or counter example:

i) $\forall p \exists q(4pq = 4),\ p \in \mathbb{R}^+, q \in \mathbb{N}$

ii) $\exists p(p^8 < p^4),\ p \in \mathbb{R}^+$

iii) $\forall x(12x \geq 3x),\ x \in \mathbb{Z}$

(c) Use series of logical equivalences to check if $\neg[(\neg p \rightarrow q) \wedge \neg p \rightarrow \neg q]$ is logically equivalent to $\neg p \wedge q$

(d) Show the relevant works to check if the rule *resolution* is valid or invalid.