CS5003
Quiz 0010

# Foundations of C.S.

Spring, 2022

PRINT NAME: _____

*SIGN*: _____

1. (10 pts) For all natural numbers $n$, $n \in \mathbb{N}$ let $p_n$ be a statement.

Suppose $p_{55}$ is true and $p_{86}$ is false. Suppose also that $p_n \Rightarrow p_{n+5}$ for all $n \in \mathbb{N}$.

Mark 10 of the statements below as follows: $T$ if it must be true, $F$ if must be false, and $X$ if it cannot be determined from the given information.

♣ By induction, $p_n$ must be true for all numbers $n$ whose decimals end in digit 0 or 5 and are at least 55. Also by induction, $p_n$ must be false for all numbers $n$ whose decimals end in digit 1 or 6 and are at most 86. All other individual values values are unknown. ♣

_____ $p_{86} \Rightarrow p_{91}$.
♣ T: Given with $n = 86$. ♣

_____ $p_n$ for all $n \in \mathbb{N}$ by induction.
♣ $F$. $p_{86}$ is false. ♣

_____ $p_{86} \Rightarrow p_{96}$.
♣ T: Since $p_{86} \Rightarrow p_{91}$ and $p_{91} \Rightarrow p_{96}$ are both true. ♣

_____ $p_{21}$ OR $p_{22}$.
♣ $X$. $p_{21}$ is false, otherwise $p_{86}$ would be true by induction. And we have no information about $p_{22}$ ♣

_____ $p_{55} \Rightarrow p_{65}$.
♣ T: Since $p_{55} \Rightarrow p_{60}$ and $p_{60} \Rightarrow p_{65}$ are both true. ♣

_____ $p_{21}$ AND $p_{22}$.
♣ $X$. $p_{21}$ is false, otherwise $p_{86}$ would be true by induction. So the AND statement is false regardless of $p_{22}$ ♣

_____ $p_{1515}$.
♣ $T$. $p$ is true for all multiples of 10 beyond 50. ♣

_____ $p_{1000n+100}$ for all $n \in \mathbb{N}$.
♣ $T$. $p$ is true for all multiples of 10 beyond 50. ♣

_____ $p_{55} \Rightarrow p_{60}$.
♣ T: Given with $n = 55$. ♣

_____ $p_{5n}$ for all $n \in \mathbb{N}$ by induction.
♣ $X$. $p_{55}$ might be the very first true statement. ♣

_____ $p_{81}$.
♣ Must be false otherwise $p_{86}$ would be true. ♣

_____ $p_{5151}$.
♣ $X$. We have no information about numbers ending in 1 beyond 81. ♣