



DEPARTMENT OF
SOFTWARE TECHNOLOGY

CCDSTRU Project Specifications

Term 2, AY 2024–2025

Due: **April 1, 2025 (T) 0800**

Implement a computer program (either in C or Java) following the specifications of the system given below.

Applicable Sets

- **A** : $\{x \in \mathbb{Z}^+ \mid x < 5\}$
- **P** : $\mathbf{A} \times \mathbf{A}$
- **B** : $\{\text{true}, \text{false}\}$
- **C** : $\{ \{(1,1), (1,2), (1,3), (1,4)\}, \{(1,1), (2,2), (3,3), (4,4)\}, \{(1,4), (2,3), (3,2), (4,1)\}, \{(4,1), (4,2), (4,3), (4,4)\} \}$
- **T** is a relation on **A** that is reflexive, symmetric, antisymmetric, and transitive

System Variables

- **Uno**, **Dos**, **Tres**, **F** $\subseteq \mathbf{P}$
- $turn \in \mathbf{B}$
- $go \in \mathbf{B}$
- $over \in \mathbf{B}$

System Facts

- **F** = **P** – (**Uno** \cup **Tres**)
- **W** = **C** – **T**
- $over \leftrightarrow (\mathbf{Uno} \in \mathbf{W} \vee \mathbf{Tres} \in \mathbf{W} \vee \mathbf{F} = \emptyset)$

System Initialization

- **Uno** = \emptyset
- **Dos** = \emptyset
- **Tres** = \emptyset
- $turn = \text{true}$
- $go = \text{false}$

System States and Behavior

NextPlayerMove ($pos \in \mathbf{P}$)

- | | | |
|--|---------------|--|
| $(turn \wedge go \wedge pos \in \mathbf{F})$ | \rightarrow | Uno = Uno $\cup \{pos\}$
$\wedge turn = \neg turn$
$\wedge go = \neg go$ |
| $(\neg turn \wedge pos \in \mathbf{Uno} \cup \mathbf{Tres})$ | \rightarrow | Uno = Uno – $\{pos\}$
$\wedge \mathbf{Tres} = \mathbf{Tres} - \{pos\}$
$\wedge turn = \neg turn$ |
| $(turn \wedge \neg go \wedge pos \in \mathbf{F})$ | \rightarrow | Tres = Tres $\cup \{pos\}$
$\wedge go = \neg go$ |

GameOver($over$)

$result \in \{\text{Uno Wins}, \text{Dos Wins}, \text{Tres Wins}\}$

- | | | |
|------------------------------|---------------|-----------------------------|
| Uno $\in \mathbf{W}$ | \rightarrow | $result = \text{Uno Wins}$ |
| F = \emptyset | \rightarrow | $result = \text{Dos Wins}$ |
| Tres $\in \mathbf{W}$ | \rightarrow | $result = \text{Tres Wins}$ |