



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**  $\subseteq \mathbf{P}$
- $go \in \mathbf{B}$
- $turn \in \mathbf{B}$
- $over \in \mathbf{B}$

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

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

#### GameOver( $over$ )

- |   |   |
|---|---|
| $result \in \{\text{Uno Wins}, \text{Dos Wins}, \text{Tres Wins}\}$ |   |
| $(over \wedge \mathbf{Uno} \in \mathbf{W})$                         | $\rightarrow result = \text{Uno Wins}$  |
| $(over \wedge \mathbf{F} = \emptyset)$                              | $\rightarrow result = \text{Dos Wins}$  |
| $(over \wedge \mathbf{Tres} \in \mathbf{W})$                        | $\rightarrow result = \text{Tres Wins}$ |