“Coffee Maker”

Description
Create a program to control a coffeemaker. The process is as follows:

1. A cup is placed by the user and the start button is pressed.
2. The cup is detected by the coffee maker on its drip tray.
3. The coffee maker’s heater begins heating the water:
    a. Water temp begins at 27°C.
    b. Water temp must rise to 96°C before brewing can begin.
    c. Water heats at a rate of 6.9°C/sec.
4. The grinder begins grinding the beans. Duration: 5 seconds.
5. The heater turns off and the coffee pours into the cup. Duration: 5 seconds.
6. A message tells the user the coffee is ready. Enjoy!
7. Machine resets to defult state after 5 seconds.

Create actions for bean grinding, water heating, and pouring.
Create a custom function block for water heating rate.
Keep track of cups produced, even after controller power cycles.

Required Components
Tasks:

- *CoffeeCtrl*

States (as Enumerated Type):

- *WAIT*
- *GRIND_BEANS*
- *HEAT_WATER*
- *POUR_COFFEE*
- *READY_TO_GO*
- *ERROR*

Structures:

- *gCoffee*
    - *Command*
        - *Start*
        - *ErrorReset*
    - *Status*
        - *CupDetected*
        - *HeaterOn*
        - *Water_Temp_OK*
        - *ActWaterTemp*
        - *GrinderOn*
        - *GrinderDone*
        - *PourCoffee*
        - *PourCoffeeDone*
        - *CoffeeReady*

        - *CoffeeString*
        - *HeatOut*
        - *Error*
- *gIO*
    - *DigitalInput*
        - *Start*
        - *CupPresent*
        - *ErrorReset*
    - *DigitalOutput*
        - *CoffeeReadyLight (green)*
        - *GrindingDone (white)*
        - *WaterTempOK (yellow)*
        - *ErrorPresent (red)*
    - *Analog Output*
        - *CupCount (7 segment)*

Constants:

- *AMBIENT_WATER_TEMP*
- *WATER_HEAT_RATE*
- *WATER_BREW_TEMP*
- *GRIND_TIME*
- *POUR_TIME*
- *RESET_TIME*
- *ENJOY_STRING*
- *EMPTY_STRING*

Retained variables:

- *gCupCount*

Simulator:

- Map Digital Input switches for start button, cup present.
- Map Digital Output LEDs for coffee ready, grinding done, TempOK, and error states.
- Map Digital Input button for error reset.