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Group #:

ECE 120 Worksheet 9: FSM design

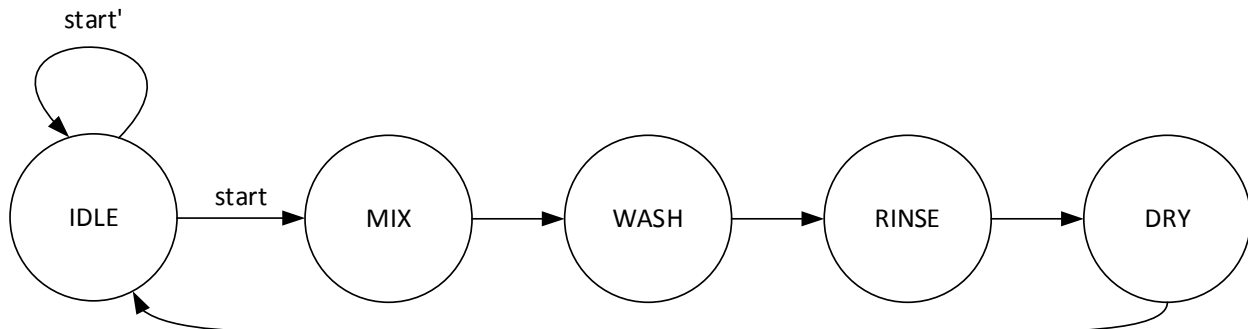
This will be an open-ended design problem, so be prepared to make assumptions, try ideas out, and revise your design as you make new realizations about the system.

Use the design procedure we taught you in lecture to design the control unit for a laundry machine. In order to wash clothes, a laundry machine must be at least be able to fill a tub with water, drain the water from that tub, dispense laundry detergent (soap) into the tub, and spin the tub (to wash, rinse, and dry the clothes).



For the sake of simplicity, we will assume that the laundry machine has a simple user-interface. The laundry machine must have a start button to begin the washing cycle. After the user presses the start button, the machine must mix detergent and water to wash the clothes, then it must rinse the clothes with just water, and finally it must spin the tub to dry the clothes.

1) Use the specification above to sketch an abstract-level state machine for your laundry machine. Do NOT encode your states with bits at this time. USE English names and descriptions for your states.



2) What inputs and outputs do you need for your state machine? Are there inputs and outputs that you might need that were not listed in the specification? If you need any counters or sensors to make your machine work, you may assume that they have been implemented to your specifications.

Start button, **S**, already specified in the problem statement.

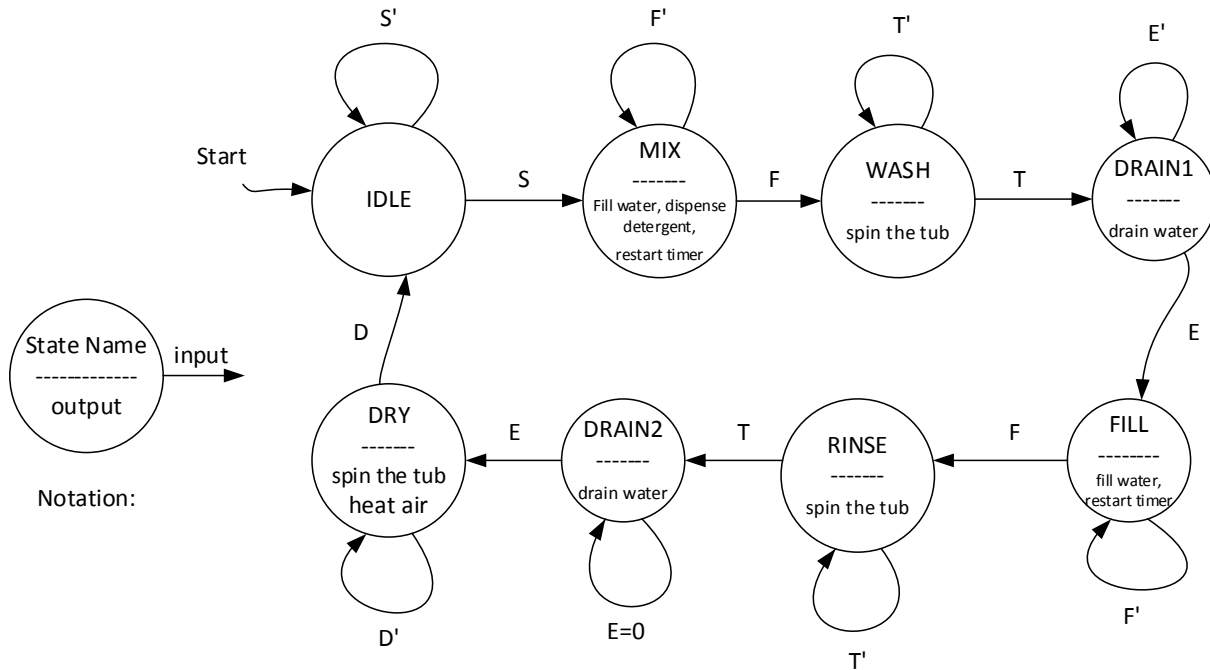
Timers for the wash and rinse cycles. For simplicity, we can assume that both cycles require the same amount of time, and thus only one timer, **T**, is sufficient. When **T=1**, time is over for the cycle.

Sensors to signal whether the water is completely drained from the machine, **E**, when the machine is filled in with a sufficient amount of water, **F**, and when the clothes are completely dry, **D**.

3) Refine your state diagram based on your work in part 2, making any implicit assumptions explicit.

We need additional states in which the water can be drained or added at the end of a particular cycle. Thus, after WASH, we need to drain dirty water and replace it with clean water for RINSE. Likewise, we need to drain water after RINSE in order to DRY.

We also need to specify inputs from the timer and sensors to trigger transition between the states.



4) Government regulations require that laundry machines be safe. How would you need to modify your state machine so that it would pause the laundry machine when the door is opened?

First, we need to have a sensor input to indicate when the door is open. Next, for each of the states except IDLE state we need to add another state that would stop the machine as long as the door is open. Once the door is closed, we can transition back to the normal operation.