

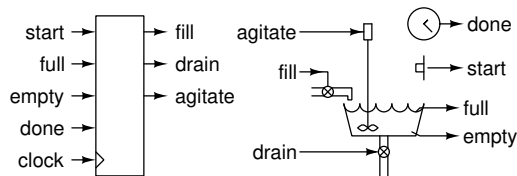
Quiz 3 - State Machines

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a: /4	b: /7	c: /3	Total: /14
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Description

The controller for a washing machine:



has three active-high outputs:

- **fill** opens a valve to fill the tub
- **drain** opens a valve to drain the tub
- **agitate** causes the agitator to turn

and three active-high inputs:

- **start** is used by the user to start or terminate a wash cycle
- **full** indicates the tub is full
- **empty** indicates the tub is empty
- **done** indicates that the agitation cycle has been running for a sufficiently long time

The controller operates as follows:

- nothing happens until the user presses **start**
- then **fill** is asserted until **full** is asserted
- then **agitate** is asserted until **done** is asserted
- then **drain** is asserted until **empty** is asserted; this completes the wash cycle
- if **start** is pressed while a wash is in progress (i.e. while **fill**'ing or **agitate**'ing) then **drain** is asserted until **empty** is asserted and this completes the wash cycle

You may assume the **start** signal is synchronized to the clock and lasts exactly one clock period.

Question

- Choose an appropriate number of states and a name for each state.
- Draw the state transition diagram. Label each state and draw a directed edge (line with an arrow) for each required state transition. On each edge write the input condition for that transition as an unambiguous equation (e.g. **start=1**). If there isn't enough space, number the transitions and list the expressions elsewhere.
- Write expressions for each of the outputs as a function of the state and the inputs (e.g. **state=drain**).