Egypt University of Informatics Faculty of Engineering		First Semester (2024/2025)
Course Name: Digital Systems Design Course Code: ECE 115	جامعة مصر للمعلوماتية EGYPT UNIVERSITY OF INFORMATICS	Instructors: Dr. Hany M. Zamel Eng. Amr Al-Iraqi

Project

You have been enlisted to design a soda machine dispenser for your department lounge. Sodas are partially subsidized by Egypt University of Informatics, so they cost only 25 cents. The machine accepts nickels (5 cents), dimes (10 cents), and quarters (25 cents). When enough coins have been inserted, it dispenses the soda and returns any necessary change. Design an FSM controller for the soda machine. The FSM inputs are Nickel, Dime, and Quarter, indicating which coin was inserted. Assume that exactly one coin is inserted on each cycle. The outputs are Dispense, ReturnNickel, ReturnDime, and ReturnTwoDimes. When the FSM reaches 25 cents, it asserts Dispense and the necessary Return outputs required to deliver the appropriate change. Then, it should be ready to start accepting coins for another soda. The registers are updated on the positive edge of the clock and reset is asynchronous active high.
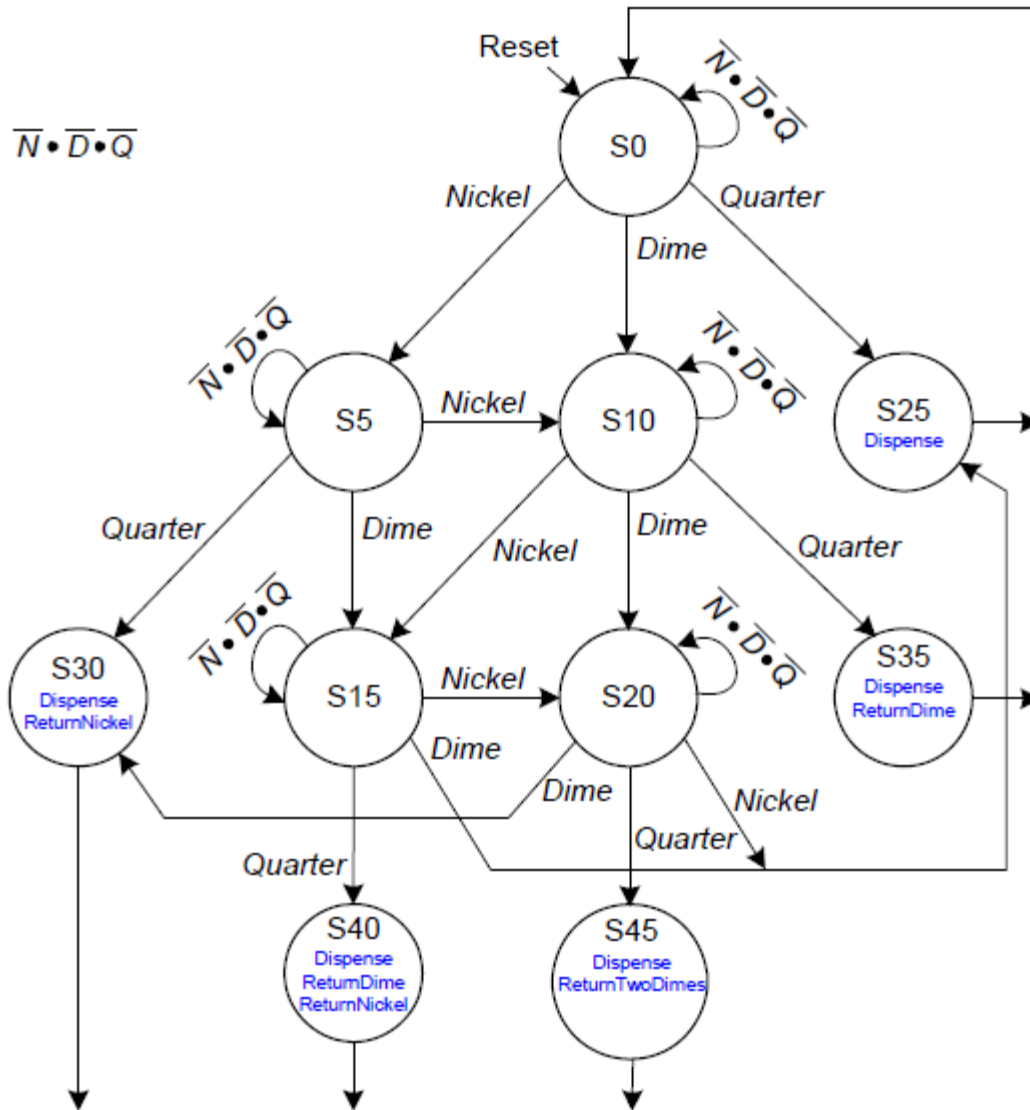
Your Testbench must test 6 cases:
1. Nickel→Nickel→Nickel→Nickel→Nickel
2. Nickel→Dime→Dime
3. Nickel→Quarter
4. Nickel→Dime→Quarter
5. Nickel→Dime→Nickel→Quarter
6. Dime→Quarter

Submit your work in a PDF report containing your team's names, member's names, and IDs on the front page. The report should be organized as the following:
1. The Design code for the FSM in Verilog.
2. The Testbench code covering the 6 scenarios mentioned above (Inputs must be entered at each negative edge of the clock).
3. Waveform snippets showing all inputs, outputs, next_state, and current_state. (Waveform is going to be too long to be captured in one screenshot, so you will probably need to insert multiple screenshots to cover the full simulation).

Remember to start your simulation with activating the reset to put your machine in a known state and to avoid any unknown behavior.

Note: $\overline{N} \cdot \overline{D} \cdot \overline{Q} = \overline{Nickel} \cdot \overline{Dime} \cdot \overline{Quarter}$