

# CS 315 Test 2 Answers

Fall 2009

Date: March 20, 2009

Location: ASA 118

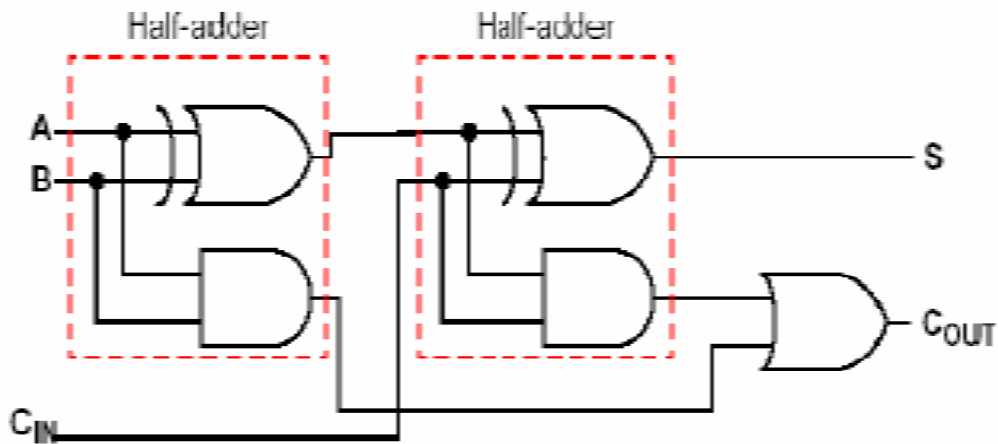
Instructor: Dr. Henry Hexmoor

Southern Illinois University

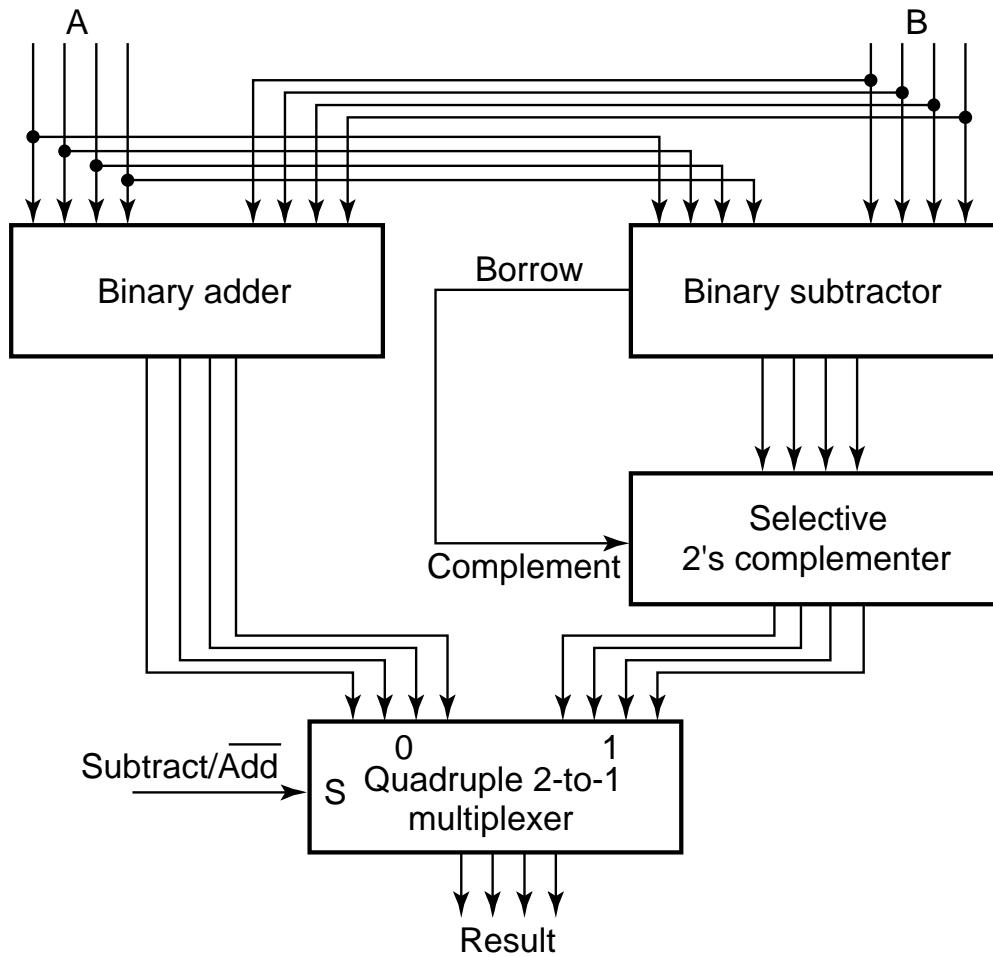
1. Draw the complete gate level circuit for the full-adder for two one bit binary numbers and a "carry in" bit. 10 points
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$$S = (A \oplus B) \oplus C_{IN}$$

$$C_{OUT} = AB + C_{IN}(A \oplus B)$$



2. Can we build a subtractor from adders? How? 15 points



3. What type of a shift micro-operation can be used on a binary number to multiply it by two. 5 points.

Answer: Shift left

4. Write the equations for J1, K1, J0, K0, and Z that correspond to the following circuit. 20 points.

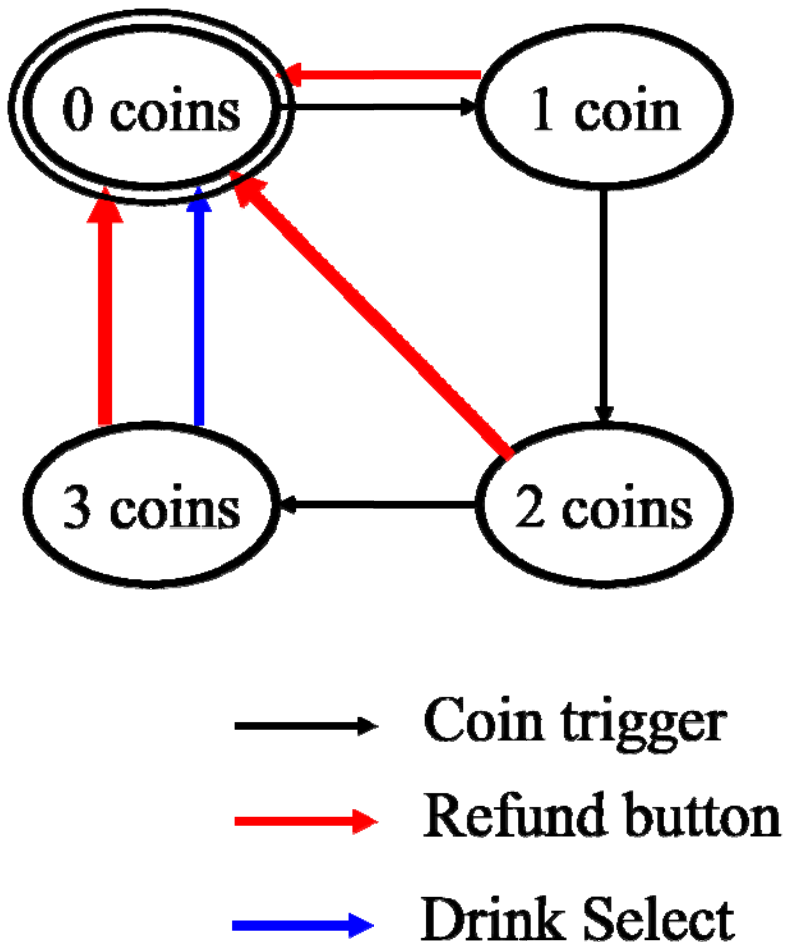
**Answer:**

$$\begin{aligned}
 J1 &= X' Q0 \\
 K1 &= X + Q0 \\
 J0 &= X + Q1 \\
 K0 &= X' \\
 Z &= Q1Q0X
 \end{aligned}$$

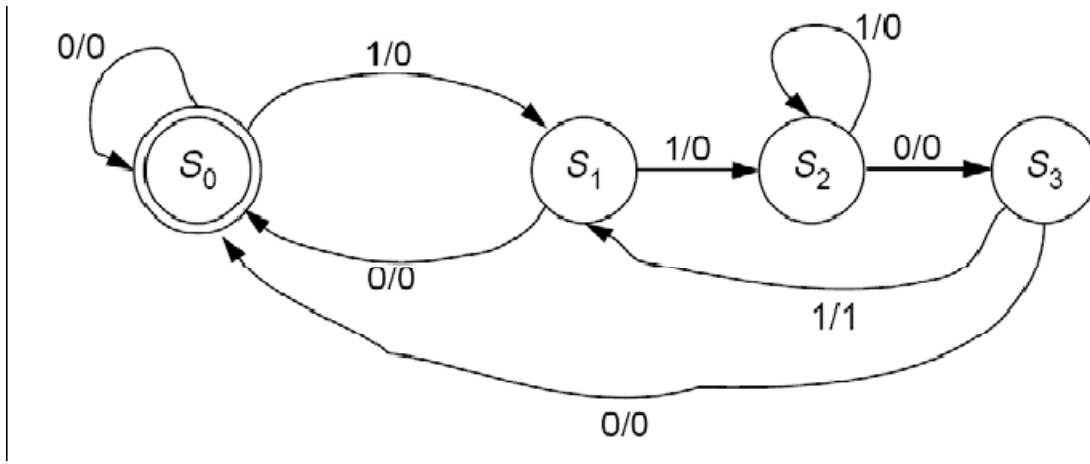
5. Consider the following state machine. Is it a mealy or moore FSM? Why? 10 points.

Answer: Moore because it maps states to outputs and inputs are not considered.

6. Draw a finite state machine for a vending machine that takes coins and dollar bills. 20 points



7. Consider the following state table. Draw the corresponding Mealy state diagram. 10 points.



8. Consider starting in state A in the following state diagram. With an input of 100100100 what is the resulting state and output? 10 points.

