

Name: _____

Honor Pledge: I am adhering to the Honor Code while taking this test.

Signature: _____

Date: _____

1. Using D flip-flops and logic gates, design a counter that outputs the following sequence: 00, 01, 10, 00, 01, 10.... (We don't care what happens if the counter is somehow forced into the unwanted state 11.)

A. How many flip-flops do you need?

B. Write out the necessary truth table, showing how Next State depends on Present State.

C. (Two points.) Write a logic equation for each bit's Next State.

D. If the initial state is 11, what will the next state be (according to your logic equations)?

E. (Two points.) Write out the circuit diagram.

2. Using D flip-flops and logic gates, design a Mealy machine that detects the sequence 0101.

A. First, list all the states (s_0, s_1 , etc.) that we need to define, and briefly define them.

B. (Four points.) Write out the state diagram (not the circuit diagram).

C. How many flip-flops do you need?

D. Write out the necessary truth table, showing how Next State and Output depend on Present State and Input.

E. (Three points.) Write a logic equation for each bit's Next State and for the Output.

F. (Three points.) Write out the circuit diagram.