Logic design (2018 fall)
Quiz # 14

Name:_____ID:_____

(100%) A sequential circuit has an input X and outputs (Y and Z). YZ represents a 2-bit binary number equal to the number of pairs of adjacent 1's that have been received as inputs. For example, the input sequence 0110 contains one pair, the sequence 01110 two pairs, and the sequence 0110111 contains three pairs of adjacent 1's. The circuit **RESETS** when the total number of pairs of 1's received reaches four, and recalculates the number of pairs of adjacent 1's just like the beginning of the sequence (as shown in the following examples). Find a Moore state graph and table for the circuit (hint: 8 states are sufficient).

Examples:

Input sequence: $X = 0\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 0\ 0\ 1\ 0\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0$

Output sequences: $Y = 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 1$

$Z = 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0\ 0$

Input sequence: $X = 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1$

Output sequences: $Y = 0\ 0\ 1\ 1\ 0\ 0\ 0\ 1$

$Z = 0\ 1\ 0\ 1\ 0\ 0\ 1\ 0$

(Be sure that the circuit resets as shown in the example)

a. (50%) Derive the following state able for the Moore machine.

State	Next State		YZ
	X = 0	X = 1	
S_0			
S_1			
S_2			
S_3			
S_4			
S_5			
S_6			
S_7			

b. (50%) Complete the state graph for this Moore machine.

a. (50%) Derive the following state able for the Moore machine.

State	Next State		YZ
	$X = 0$	$X = 1$	
S_0	S_0	S_1	00
S_1	S_0	S_2	00
S_2	S_3	S_4	01
S_3	S_3	S_2	01
S_4	S_5	S_6	10
S_5	S_5	S_4	10
S_6	S_7	S_0	11
S_7	S_7	S_6	11

b. (50%) Complete the state graph for this Moore machine.