Answers Homework 6

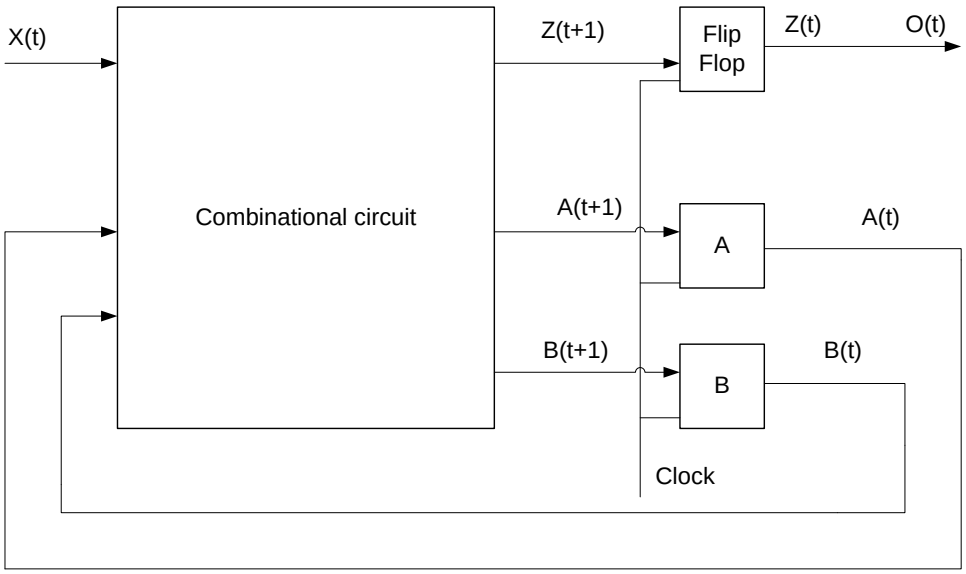
A sequential circuit with two flip-flops A and B, one input X, and one output Z is specified by the following equations:

A(t+1) = X'A(t) + XB(t)
B(t+1) = X'A(t)'
Z = XA(t) + XB(t)'

Transform and implement the sequential circuit as Moore finite state machine (FSM):

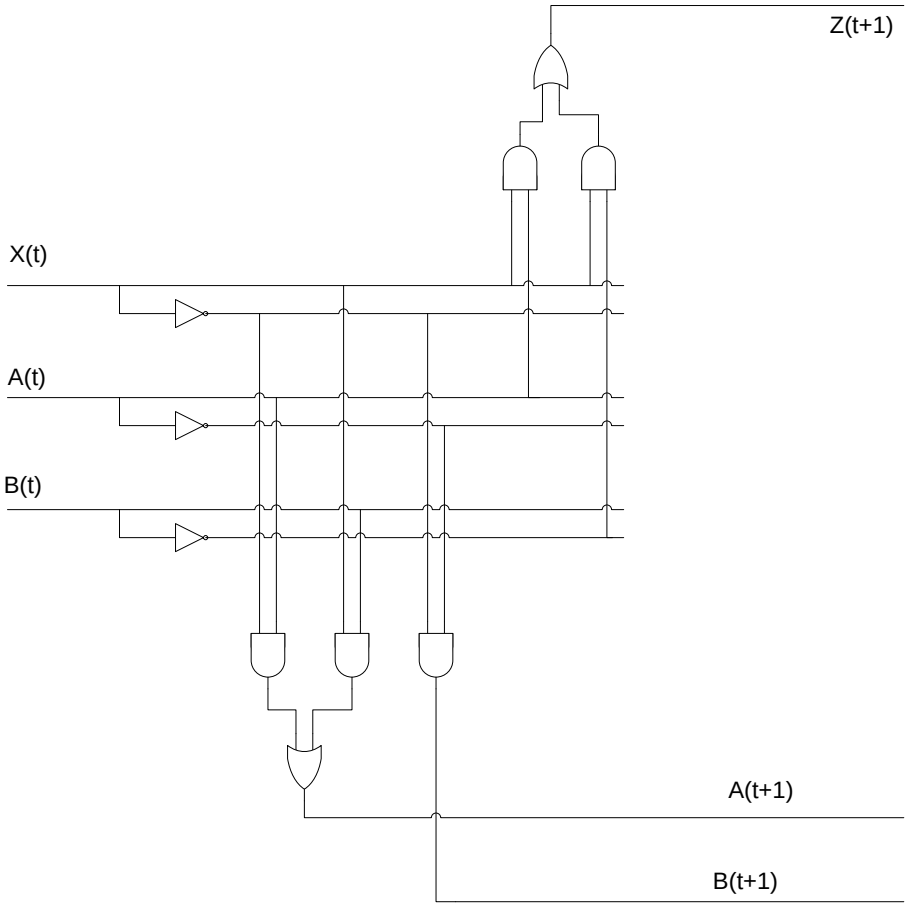
(a) Draw the logic diagram of the Moore FSM;
(b) Derive the state table of the Moore FSM;
(c) Derive the state diagram of the Moore FSM;

We want a Moore state machine so our output only changes on a clock pulse. This is achieved by using Z as input for a flip-flop whom state only changes on a clock pulse.



We get the following equations from our circuit (because of the Moore machine)
A(t+1) = X(t)'A(t) + X(t)B(t)
B(t+1) = X(t)'A(t)'
Z(t+1) = X(t)A(t) + X(t)B(t)'
O(t) = Z(t)

Here is the combinational circuit block based on the equations.



Here is the state table that we can derive out of the equations. It is the same as a truth table for Boolean functions only now the output depends on the current state.

X(t)	A(t)	B(t)	Z(t)	A(t+1)	B(t+1)	Z(t+1)	O(t)
0	0	0	0	0	1	0	0
0	0	0	1	0	1	0	1
0	0	1	0	0	1	0	0
0	0	1	1	0	1	0	1
0	1	0	0	1	0	0	0
0	1	0	1	1	0	0	1
0	1	1	0	1	0	0	0
0	1	1	1	1	0	0	1
1	0	0	0	0	0	1	0
1	0	0	1	0	0	1	1
1	0	1	0	1	0	0	0
1	0	1	1	1	0	0	1
1	1	0	0	0	0	1	0
1	1	0	1	0	0	1	1
1	1	1	0	1	0	1	0
1	1	1	1	1	0	1	1

Finally, we draw the state diagram. We have 8 states because we have 3 flip flops. Just follow the state table to make this diagram.