CprE 2810 HW11

ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Moore & Mealy Machines

Finish by Nov. 18, 2024

P1 (20 points) Draw the state diagram and the state table for an FSM that outputs a 0 when it detects three or more consecutive 1's from a serial 1-bit data stream and outputs 1 otherwise.

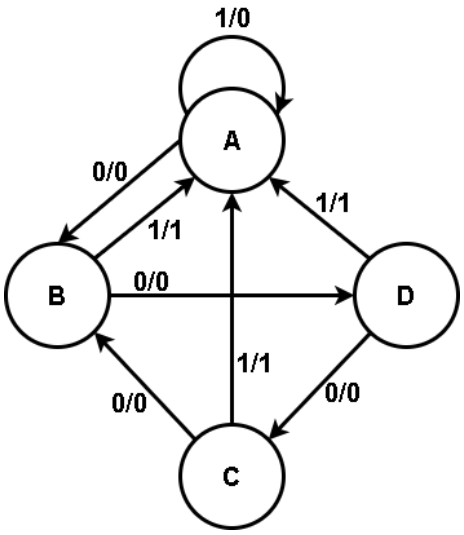
a) (10 points) Using a Mealy machine

b) (10 points) Using a Moore machine

P2 (20 points) Given the FMS state diagram shown below, answer the following:

a) (10 points) Write the state table and the state-assigned table for the FSM.
b) (10 points) Determine whether the given FSM is a Moore machine or a Mealy machine. Once you have identified the type of FSM, design the equivalent machine of the other type by drawing its corresponding state diagram.

(**Note:** don't derive expressions or draw circuits. Also, the state-table and the state-assigned table are not required for the equivalent state diagram in part b.)



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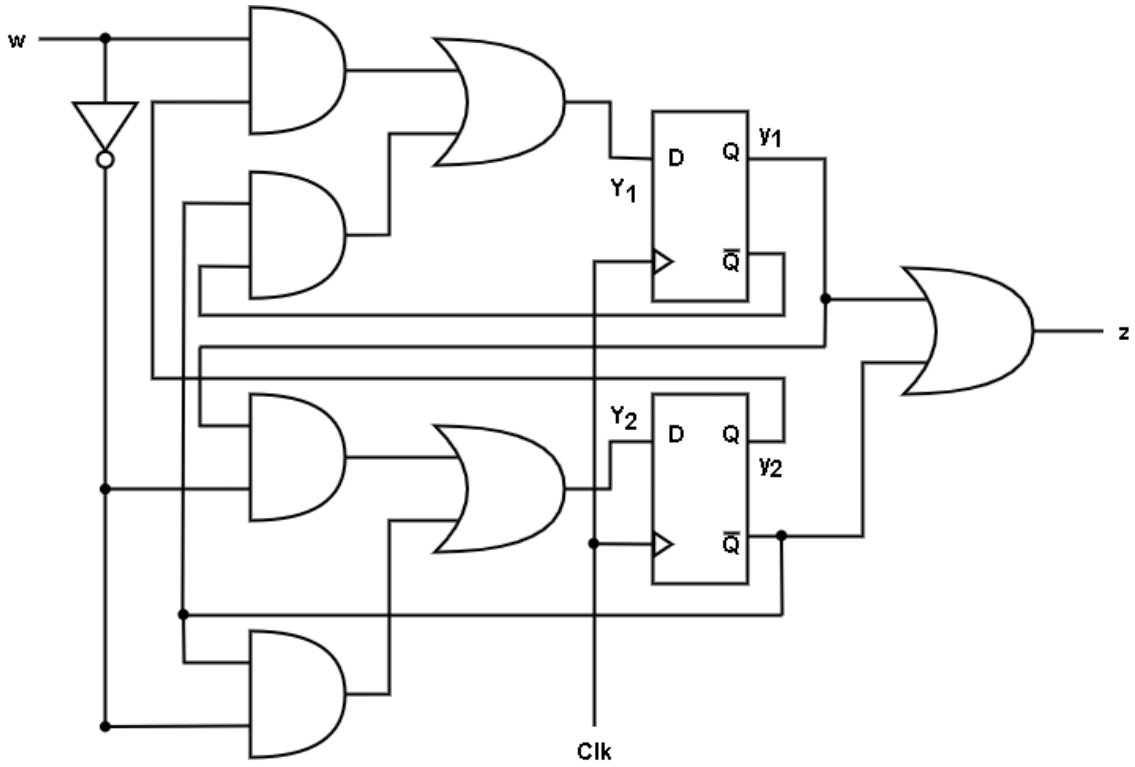
P3 (15 points) You are provided with the following state table for an FSM:

Present state	Next state		Output
	w=0	w=1	z
S0	S0	S1	0
S1	S1	S2	1
S2	S2	S1	0

a) (5 points) Perform a one-hot encoding state assignment for the FSM
b) (5 points) Use Karnaugh maps (K-maps) to derive the logical expressions for the next state variables and output.
c) (5 points) Draw the state diagram corresponding to the given state table.

P4 (15 points) You are provided with an FSM circuit diagram consisting of two D flip-flops, four AND gates, three OR gates, and a NOT gate. Based on the given circuit:

a) (5 points) Write the Boolean expressions for the next state variables and the output.
b) (5 points) Construct the state-assigned table based on your expressions.
c) (5 points) Draw the state diagram corresponding to this FSM.



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P5 (20 points) Design and implement a Moore finite state machine (FSM) that detects the sequence "1010" in a 1-bit serial input stream without overlap. The output is 1 if the sequence is detected and 0 otherwise. In your solution, include the following:

a) (5 points) Draw the state diagram for the FSM.
b) (5 points) Write the state table and the state-assigned table.
c) (5 points) Derive the logical expressions for the next state and output variables.
d) (5 points) Draw the circuit diagram using D flip-flops based on the derived expressions.

P6 (10 points) Perform state minimization using the partition minimization procedure to reduce the number of states for the given state table and write the state table after state minimization.

Present state	Next state		Output
	w=0	w=1	z
A	B	C	1
B	D	E	1
C	D	F	0
D	D	D	1
E	E	G	0
F	F	G	0
G	G	G	0