CprE 2810 HW11
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Moore & Mealy Machines

Finish by Nov. 17, 2025

P1 (20 points) Draw the state diagram and state table for an FSM that has an input **w** and an output **z**. The machine should output **z=1** only when the sequence "110" has been detected on **w** in the previous three clock cycles. Otherwise, the output should be 0. For each part, provide a clear state diagram and the corresponding state table.

a) (10 points) Implement this as a **Mealy** machine.
b) (10 points) Implement this as a **Moore** machine.

P2 (20 points) You are given the state-assigned table for an FSM below. The state variables are **y2** and **y1**.

Present State	y2 y1	Next State Y2 Y1 (w=0)	Next State Y2 Y1 (w=1)	Output z
A	0 0	0 1	1 0	0
B	0 1	0 0	1 1	1
C	1 0	0 1	1 1	0
D	1 1	1 1	0 0	1

a) (5 points) Is this a Moore or a Mealy machine? Justify your answer.
b) (10 points) Derive the minimized logic expressions for the next-state Y2, Y1, and the output **z**. (You may use K-maps).
c) (5 points) Draw the state diagram for this FSM.

P3 (20 points) Design an FSM that has a single input **w** and a single output **z**. The circuit should output **z=1** when exactly two of the last three input values received on **w** were 1; otherwise, **z=0**. For example:

Input sequence: 0, 1, 0, 1, 1, 0, ...
Output sequence: 0, 0, 0, 1, 1, 1, ...

a) (5 points) Draw the state diagram for this Mealy machine.
b) (5 points) Write the state table and the state-assigned table using binary encoding.
c) (5 points) Derive the minimized logic expressions for the next-state and the output variables.
d) (5 points) Draw the circuit diagram using D flip-flops based on the derived expressions.

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P4 (20 points) Use the partitioning method to minimize the number of states in the FSM described by the state table below. Show your work for each partition.

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

a) (15 points) Show the process of iterative partitioning until no further partitions can be made. List the equivalent states.

b) (5 points) Write the minimized state table.

P5 (20 points) Design an FSM that detects the sequence "110" on a serial input line **w**. The output **z** should be 1 for every clock cycle that completes the sequence.

a) (5 points) Draw the state diagram for this Moore machine. Do we need to consider the overlapping scenario for this question?

b) (5 points) Derive the state table.

c) (5 points) Perform a one-hot state assignment and write the state-assigned table.

d) (5 points) Write the next-state and output equations directly from the state-assigned table. (Do not minimize them). Explain why one-hot encoding can often lead to simpler next-state logic.