

Logic design (2016 fall)

Quiz # 14

Name: _____ ID: _____

Derive the state table for the following Moore machine containing one input (x) and one output (z). z=1 if and only if the previous 4 inputs were not a valid excess-3 encoding of a decimal digit; otherwise, z=0.

Assume that (1) in the reset state all previous inputs were 0 and (2) the excess-3 digits are received least significant bit first. That is, ..., 1, $\frac{1}{2^0}$, $\frac{1}{2^1}$, $\frac{0}{2^2}$, $\frac{1}{2^3}$, = 11_{dec}

(a) (50%) Finish the following state table with the given description of each state.

State	Next State		z	State Description
	x=0	x=1		
S0				Previous 4 bits: 0000
S1				Previous 4 bits: 0001
S2				Previous 4 bits: 0010
S3				Previous 4 bits: 0011
S4				Previous 4 bits: 0100
S5				Previous 4 bits: 0101
S6				Previous 4 bits: 0110
S7				Previous 4 bits: 0111
S8				Previous 4 bits: 1000
S9				Previous 4 bits: 1001
S10				Previous 4 bits: 1010
S11				Previous 4 bits: 1011
S12				Previous 4 bits: 1100
S13				Previous 4 bits: 1101
S14				Previous 4 bits: 1110
S15				Previous 4 bits: 1111

(b) (50%) Finish the following state table with the given description of each state. (8 states are sufficient.)

State	Next State		z	State Description
	x=0	x=1		
S0				Previous 4 bits:1100
S1				Previous 4 bits: -001
S2				Previous 4 bits: -010
S3				Previous 4 bits: 0011
S4				Previous 4 bits: -101
S5				Previous 4 bits: -110
S6				Previous 4 bits: -000, 0-00
S7				Previous 4 bits: -111, 1011

(a) (60%) Derive the state table for a Moore machine. Assume that in the reset state all previous inputs were 0. ($z=1$ if and only if the previous 4 inputs were not a valid excess-3 digit)

State	Next State		z	State Description
	x=0	x=1		
S0	S0	S1	1	Previous 4 bits: 0000
S1	S2	S3	0	Previous 4 bits: 0001
S2	S4	S5	0	Previous 4 bits: 0010
S3	S6	S7	0	Previous 4 bits: 0011
S4	S8	S9	1	Previous 4 bits: 0100
S5	S10	S11	0	Previous 4 bits: 0101
S6	S12	S13	0	Previous 4 bits: 0110
S7	S14	S15	1	Previous 4 bits: 0111
S8	S0	S1	1	Previous 4 bits: 1000
S9	S2	S3	0	Previous 4 bits: 1001
S10	S4	S5	0	Previous 4 bits: 1010
S11	S6	S7	1	Previous 4 bits: 1011
S12	S8	S9	0	Previous 4 bits: 1100
S13	S10	S11	0	Previous 4 bits: 1101
S14	S12	S13	0	Previous 4 bits: 1110
S15	S14	S15	1	Previous 4 bits: 1111

(b) (40%) Derive the following state table (with description of every state) for a Moore machine. (Eight states are sufficient.)

State	Next State		z	State Description
	x=0	x=1		
S0	S6	S1	0	Previous 4 bits:1100
S1	S2	S3	0	Previous 4 bits: -001
S2	S6	S4	0	Previous 4 bits: -010
S3	S5	S7	0	Previous 4 bits: 0011
S4	S2	S7	0	Previous 4 bits: -101
S5	S0	S4	0	Previous 4 bits: -110
S6	S6	S1	1	Previous 4 bits: -000, 0-00
S7	S5	S7	1	Previous 4 bits: -111, 1011