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Assignment 3

a) states
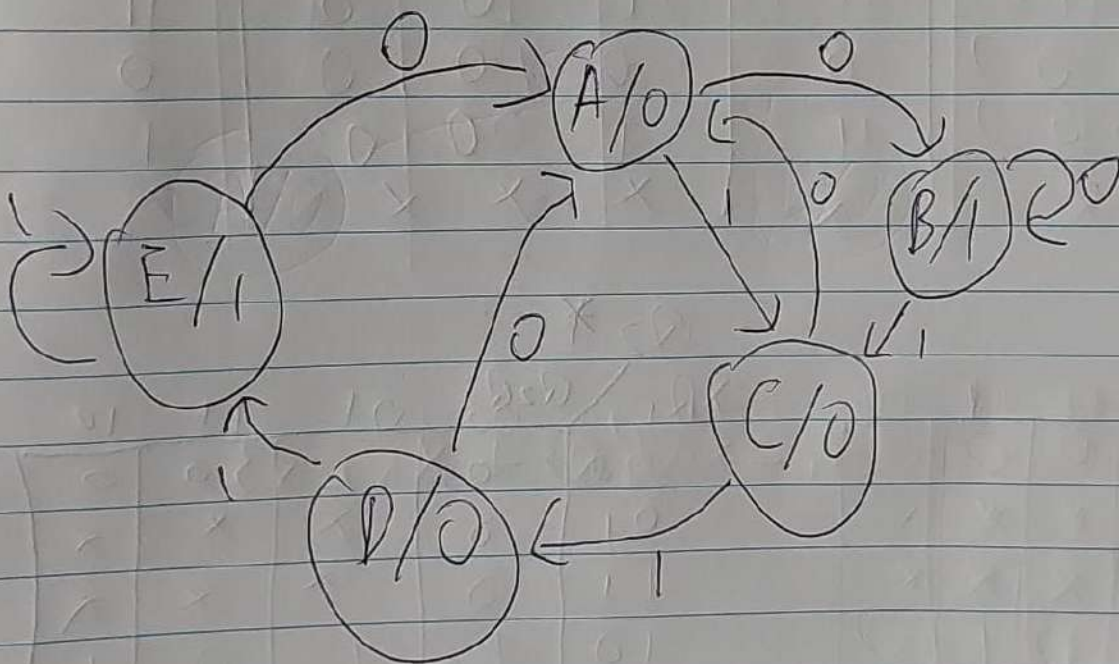
A: Input is '0'
B: Two '0' is detected (00) and output 1
C: One '1' is detected
D: sequence "11" is dected
E: sequence "111" is decated and output 1

B)

Present State (Q₁ Q₂ Q₃)	Input X	Next State Q₁* Q₂* Q₃*			Present Output Z
A (0 0 0)	0	0	0	1	1
A (0 0 0)	1	0	1	0	0
B (0 0 1)	0	0	0	1	1
B (0 0 1)	1	0	1	0	0
C (0 1 0)	0	0	1	0	0
C (0 1 0)	1	0	1	1	0
D (0 1 1)	0	0	0	0	0
D (0 1 1)	1	1	0	0	1
E (1 0 0)	0	0	0	0	0
E (1 0 0)	1	1	0	0	1
other	X	X	X	X	X

c)

Q_1^*

X Q₁ \ Q₂Q₃	00	01	11	10
0 0	0	0	0	0
0 1	0	X	X	X
1 1	1	X	X	X
1 0	0	0	1	0

$$D_1 = Q_1^* = XQ_1 + XQ_2Q_3$$

Q_2^*

X Q₁ \ Q₂Q₃	00	01	11	10
0 0	0	0	0	0
0 1	0	X	X	X
1 1	0	X	X	X
1 0	1	1	0	1

$$D_2 = Q_2^* = XQ_1'Q_2' + XQ_1'Q_3'$$

Q_3^*

X Q₁ \ Q₂Q₃	00	01	11	10
0 0	1	1	0	0
0 1	0	X	X	X
1 1	0	X	X	X
1 0	0	0	0	1

$$D_3 = Q_3^* = X'Q_1'Q_2' + XQ_2Q_3'$$

Z

X Q₁ \ Q₂Q₃	00	01	11	10
0 0	1	1	0	0
0 1	0	X	X	X
1 1	1	X	X	X
1 0	0	0	1	0

$$Z = XQ_1 + X'Q_1'Q_2' + XQ_2Q_3$$

c)
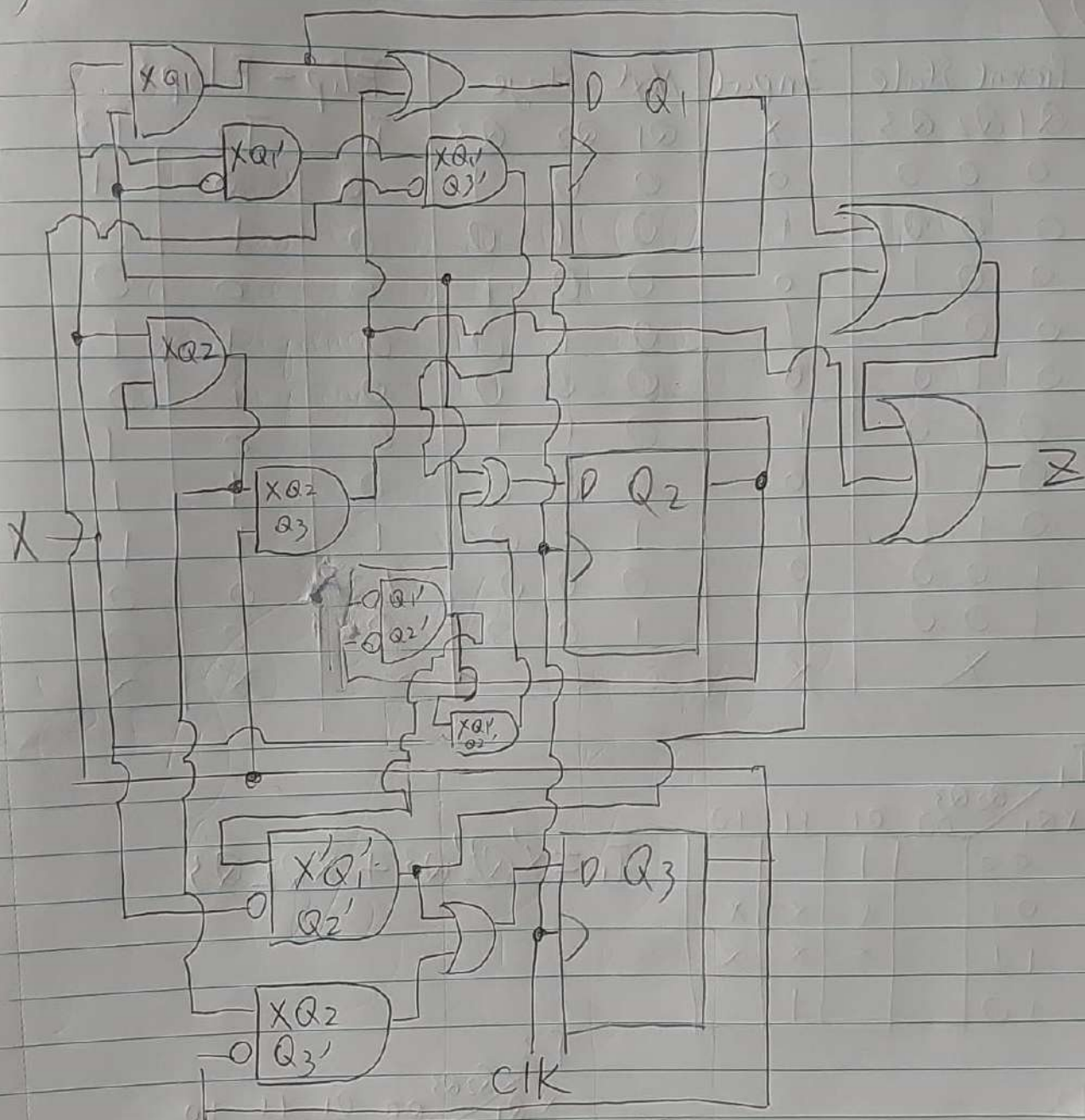
D/

Present State Q1 Q2 Q3	Input X	Next Stage Q1 Q2 Q3	Flip-Flops T1 T2 T3		
0 0 0	0	0 0 1	0	0	1
0 0 0	1	0 1 0	0	1	0
0 0 1	0	0 0 1	0	0	0
0 0 1	1	0 1 0	0	1	1
0 1 0	0	0 0 0	0	1	0
0 1 0	1	0 1 1	0	0	1
0 1 1	0	0 0 0	0	1	1
0 1 1	1	1 0 0	1	1	1
1 0 0	0	0 0 0	1	0	0
1 0 0	1	1 0 0	0	0	0
X	X	X	X	X	X

T1

$$T_1 = X'Q_2'Q_3 + XQ_2Q_3$$

XQ1 \ Q2Q3	00	01	11	10
0 0		1		
0 1		X	X	X
1 1		X	X	X
1 0			1	1

T2

XQ1 \ Q2Q3	00	01	11	10
0 0			1	1
0 1		X	X	X
1 1		X	X	X
1 0	1	1	1	1

$$T_2 = XQ_1'Q_2' + Q_2Q_3 + X'Q_2$$

T3

XQ1 \ Q2Q3	00	01	11	10
0 0	1		1	
0 1		X	X	X
1 1		X	X	X
1 0		1	1	1

$$T_3 = X'Q_1'Q_2'Q_3' + Q_2Q_3 + XQ_3 + XQ_2$$