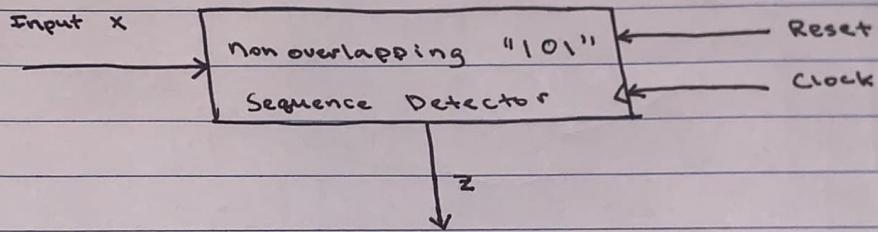


## Homework #4

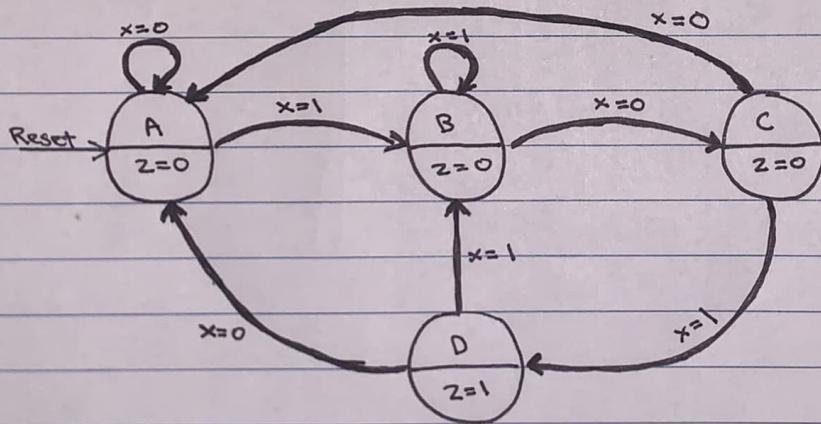
5.8

Design a Moore sequence recognizer that detects the nonoverlapping sequence "101". Use binary encoded state labels and design and draw the circuit schematic similar to the one shown in Fig. 5.16.

Step 1: Block Diagram FSM



Step 2: Create Moore FSD - Finite State Diagram



Step 3: Determine the minimum # of bits required to store the states.

$$\text{Number of Bits} = \log_2 [4] = 2$$

Step 4: From the FSD, create the truth table for NSG  
 (Next State Generator)

$$A = 00$$

$$B = 01$$

$$C = 10$$

$$D = 11$$

Truth Table

		Current State		Input X	Next State		Z
		$q_1$	$q_0$		$d_1$	$d_0$	
0	A	0	0	0	0	0	A
1		0	0	1	0	1	B
2	B	0	1	0	1	0	C
3		0	1	1	0	1	B
4	C	1	0	0	0	0	A
5		1	0	1	1	1	D
6	D	1	1	0	0	0	A
7		1	1	1	0	1	B

Step 5: Create Output Generator (OG)

$$\text{output} = Z$$

	Current state		Output (OG)
	$q_1$	$q_0$	
0	A	0	0
1	B	0	0
2	C	1	0
3	D	1	1

Step 6: From the truth table, determine minimum SOP for each of the states, variables  $d_1$  and  $d_0$ , and output  $Z$ .

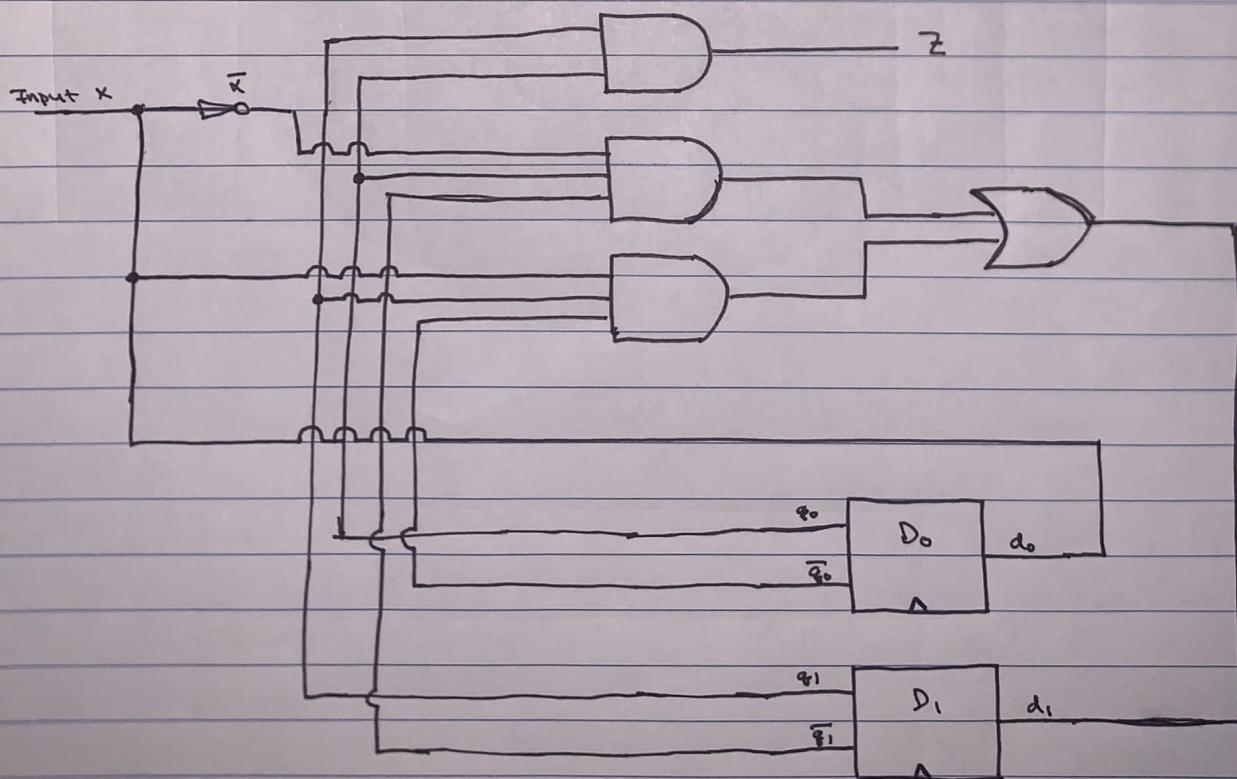
$$d_1 = \bar{x}\bar{q}_1 q_0 + x q_1 \bar{q}_0$$

		00	01	11	10
		0	(1)		
x	$\bar{q}_1 q_0$	0			(1)
1					

$$d_0 = x$$

$$Z = q_1 q_0$$

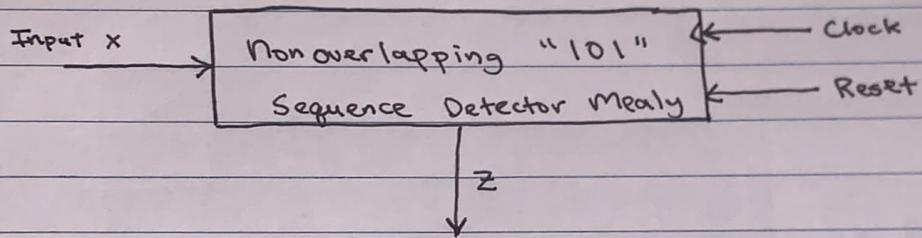
Step 7: Build or design the circuit that detects "101"



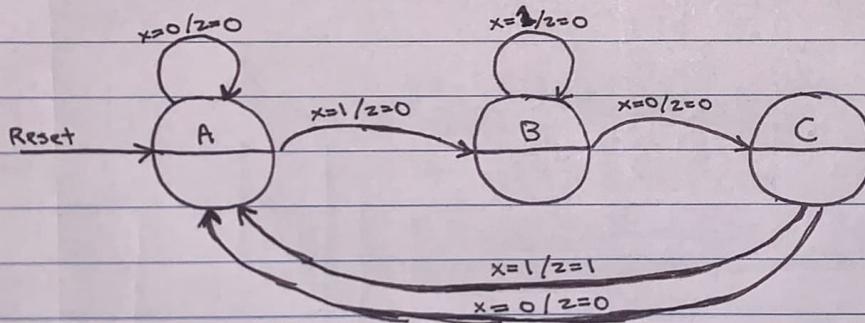
(S.9)

Design a Mealy sequence recognizer that detects the nonoverlapping sequence "101". Use binary encoded state labels and draw the circuit schematic similar to the one shown in Figure 5.16.

Step 1 : Block Diagram of the Mealy Machine



Step 2 : Create a Mealy FSD - Finite State Diagram



Step 3 : Determine the minimum # of bits required to store the states.

$$\text{Number of Bits} = \log_2[3] = 1.58 \xrightarrow{\text{round up}} 2$$

Step 4 : From FSD, Create the truth table. Let  $Q_0 = A$ ,  $Q_1 = B$ ,  $10 = C$ ,  $11 = D$

	Current State	Input X	Next State			Z
			$q_1$	$q_0$	$d_1$	
0	A	0	0	0	0	0
1		0	0	1	0	1
2	B	0	1	0	1	0
3		0	1	1	0	0
4	C	1	0	0	0	0
5		1	0	1	0	1
6	D	1	1	d	d	d
7		1	1	d	d	d

Step 5 : Determine the logical expressions

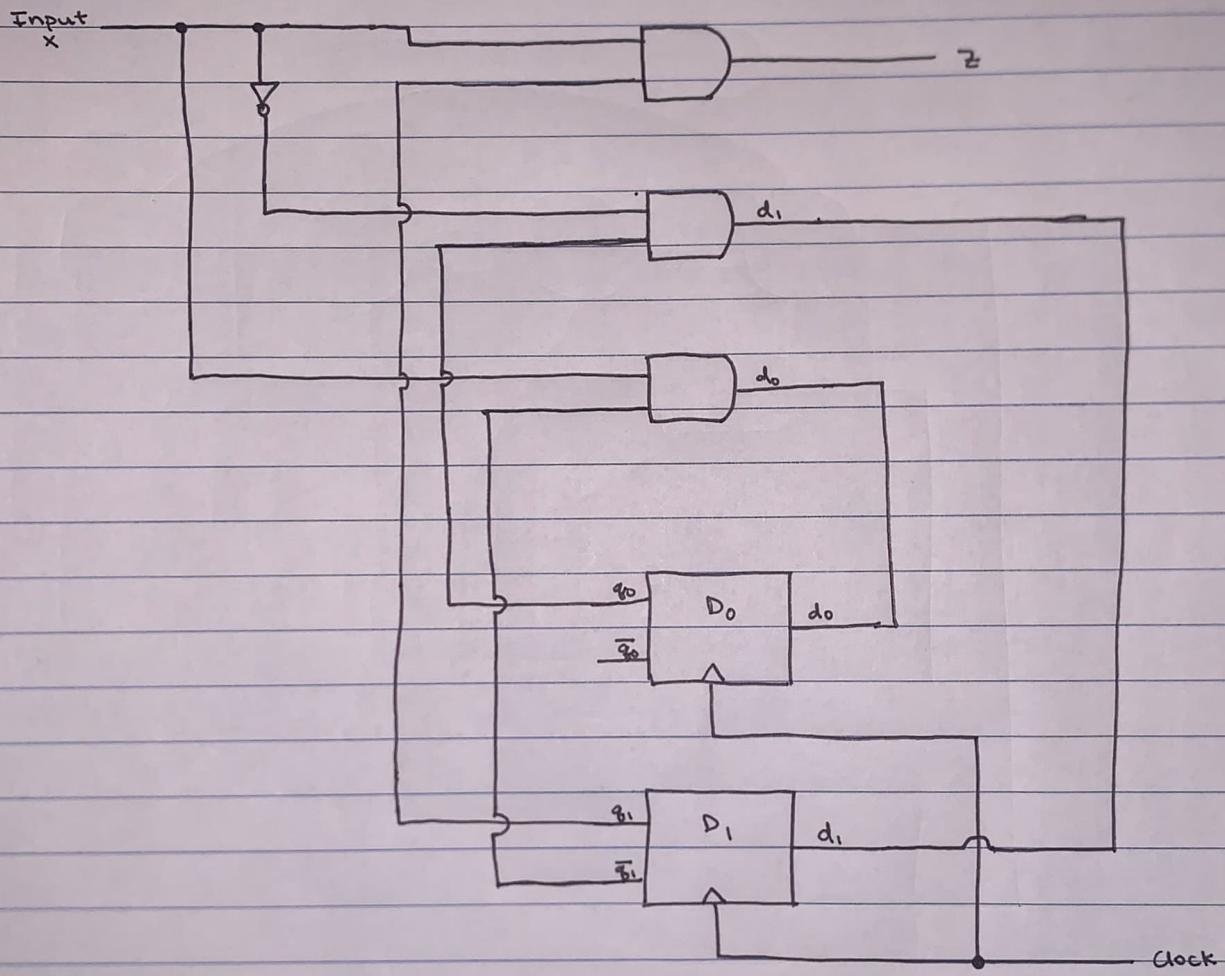
$$d_1 = \bar{x} \bar{q}_1 q_0 = \boxed{\bar{x} q_0}$$

$$d_0 = x \bar{q}_1 \bar{q}_0 + x \bar{q}_1 q_0 = \boxed{x \bar{q}_1}$$

$d_0$	$x \bar{q}_1 \bar{q}_0$	00	01	11	10
0					
1		1	1		

$$Z = \boxed{x q_1 \bar{q}_0} = \boxed{x q_1}$$

Step 6: Draw the Circuit Diagram



S.10

Design a Moore sequence recognizer that detects the overlapping sequence "1001". Use binary encoded state labels. (Step 1, FSD only)

