

## More examples of Seq circuit design

Requests

③ ① Mealy + Moore for same problem

② → ② The effect of start state

① → ③ Excitation table J-K ff

Q	Q <sup>+</sup>	J	K
0	0	0	d
0	1	1	d
1	0	d	1
1	1	d	0

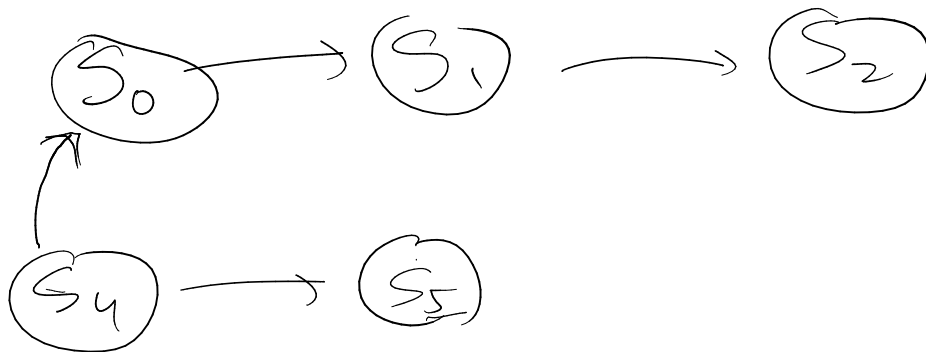
Set Reset		$Q^+$
J	K	
0	0	$Q$ (hold) ✓
0	1	0 (reset) ✓
1	0	1 (set)
1	1	$\bar{Q}$ (toggle)

Excitation table

$Q \rightarrow Q^+$	J	K	J	K
0 0	[hold 0 0]	[reset 0 1]	0	d
0 1	[toggle 1 1]	[set 1 0]	1	d
1 0	[toggle 1 1]	[reset 0 1]	d	1
1 1	[hold 0 0]	[set 1 0]	d	0

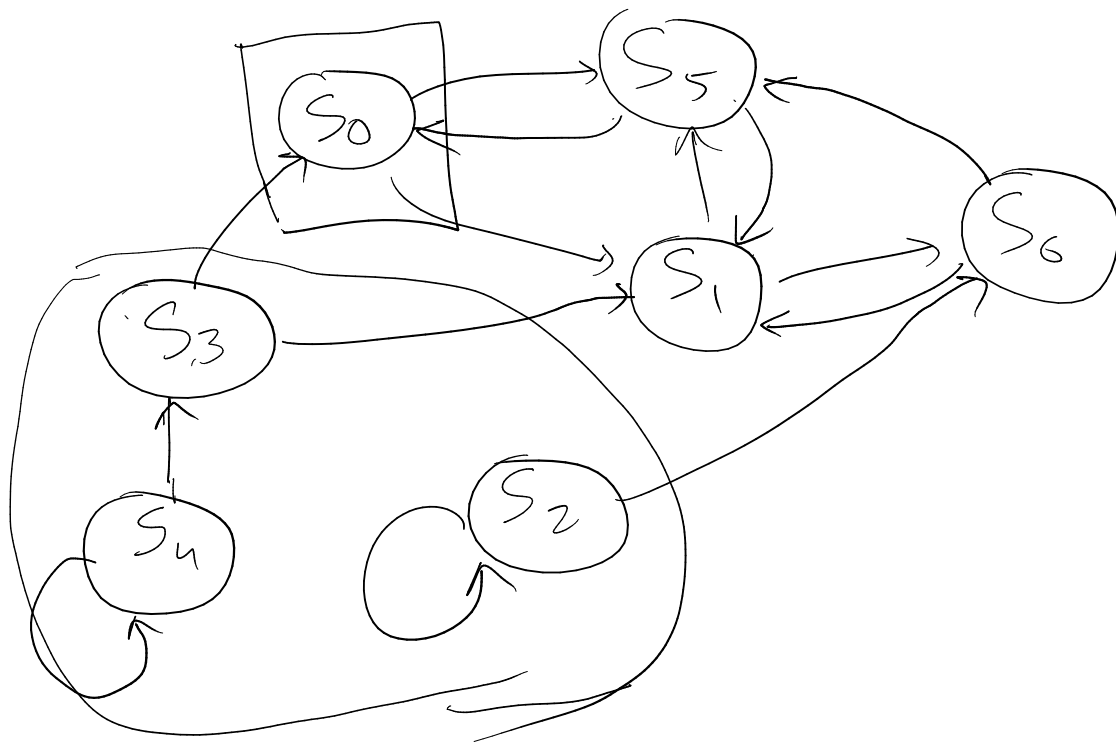
Prob 5.2

state diagram



$S_2$  is reachable from  $S_0$

$S_5$  is not reachable from  $S_0$



Moore  $X = 1100011010$   
 $Z = 00000011001$

and Moore

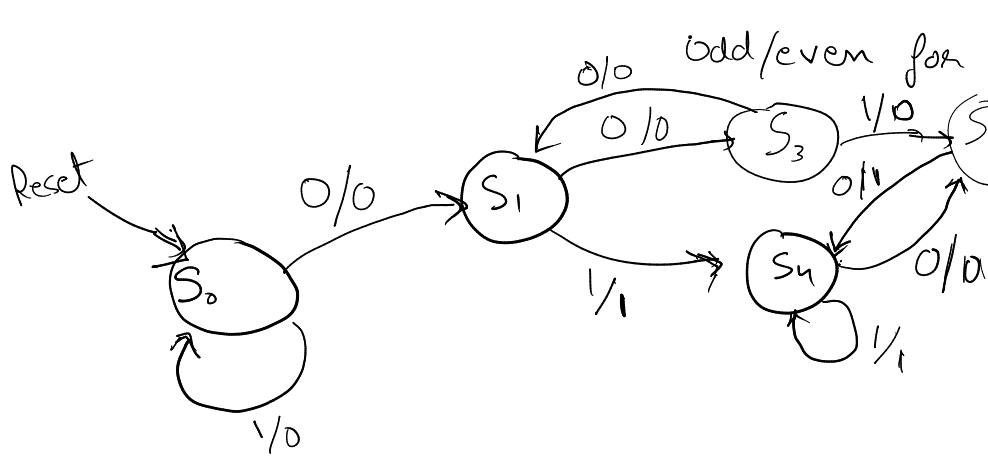
Design a Mealy sequential circuit which investigates an input sequence X and will produce an output of Z=1 whenever the total number of 0's in the sequence is odd, provided that the sequence 01 has occurred at least once.

Example: (Mealy)  
 $X = 1100011010$   
 $Z = 00000011001$

Not detected detected  
 $A = 0 \quad A = 1$

Mealy state diagram

meat Sequence detector for "01" → "0" "1"



odd  $E = 0$  output 1  
 even  $E = 1$  output 0

$S_0 = (A=0, "", E=1)$   
 $S_1 = (A=0, "0", E=0)$   
 $S_2 = (A=0, "1", E=1)$   
 $S_3 = (A=0, "0", E=1)$   
 $S_4 = (A=1, "1", E=0)$   
 $S_5 = (A=0, "0", E=0)$   
 $S_6 = (A=1, "1", E=1)$

Mealy state diagram

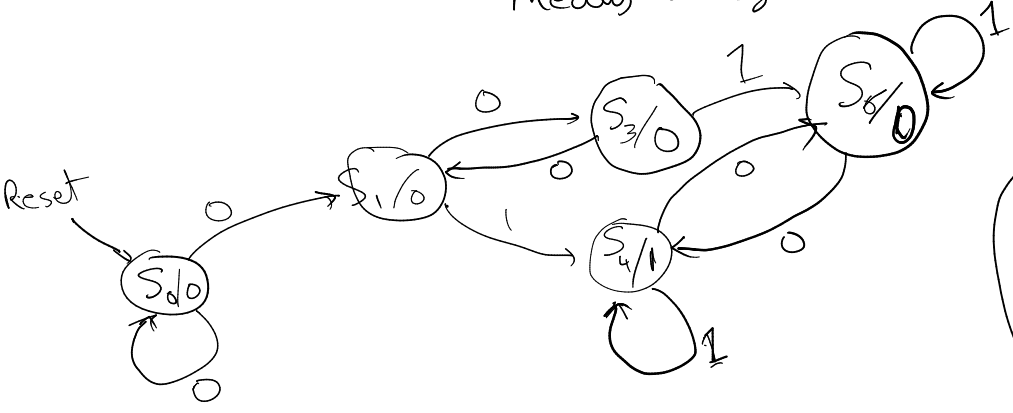
$X = 1100011010$   
 $Z = 00000011001$

001

1010

0010 4 digit in Moore  
 Mealy 3-digit

Sequence detector = "01" "x0" "xx"



$S_0 = (A=0, "0" or "xx", E=1)$   
 $S_1 = (A=0, "0" or "x0", E=0)$   
 $S_2 = (A=0, "1" or "xx", E=1)$   
 $S_3 = (A=0, "x0", E=1)$   
 $S_4 = (A=1, "01", E=0)$  add  
 $S_5 = (A=0, "x0", E=0)$   
 $S = (A=1, "01", E=1)$

Sequence detector  
 Accept "1010", "x101",  
 "xx10", "xxx1"  
 Reject "xxxx"

0001 ad  
 #0s