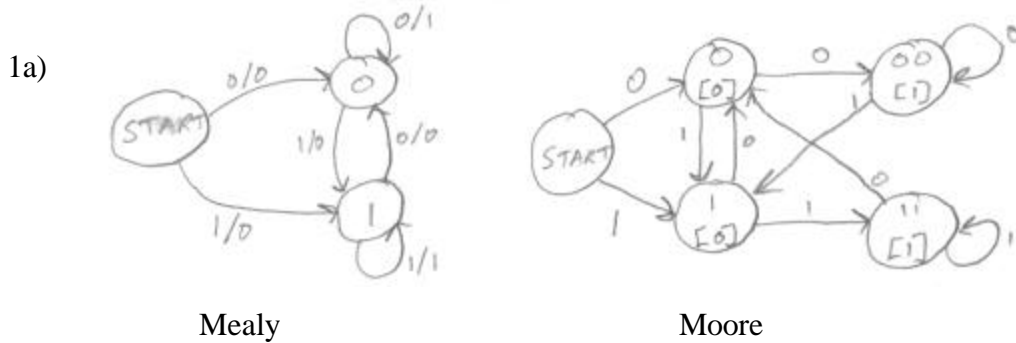
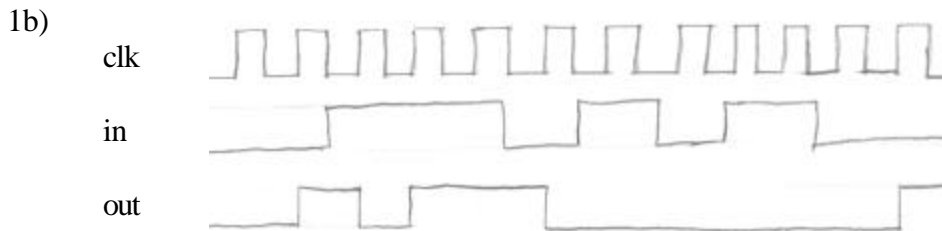


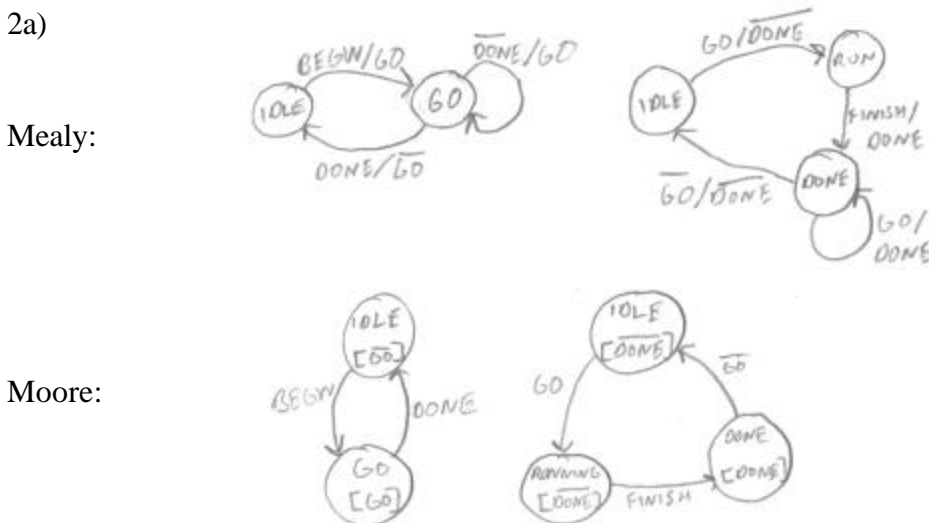
# Problem Set 7 Solutions



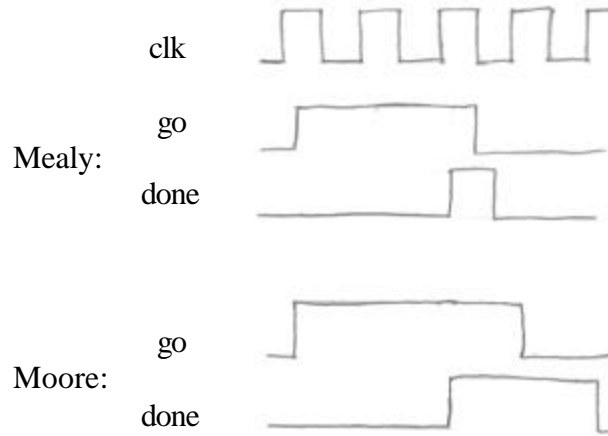
Since the output of Mealy Machines depend on both the current state and the current input, they don't need as many states to represent input/output combinations.



1c) The timing behaviors of a Moore Machine and a Synchronous Mealy Machine are the same. The Mealy Machine will behave differently because the output changes as soon as the input changes rather than at the next clock cycle.



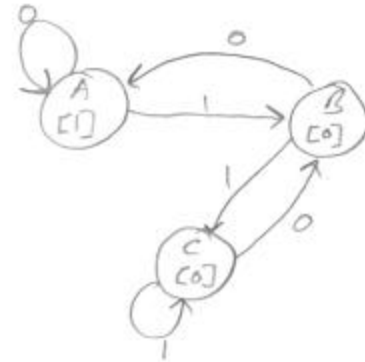
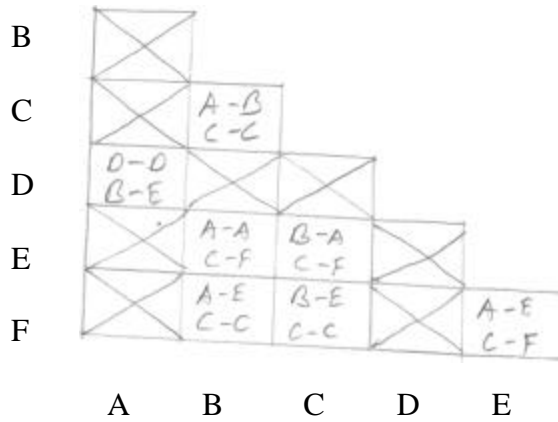
2b)



2c) If the two clocks are not synchronized, the input of one machine can change during the second one's setup or hold time and be lost before the second machine can react to it.

2d) If they are synchronous, the machines will now work together with no problems.

3) A = D  
B = E  
C = F



4a) A=00  
 B=01  
 C=10

S1	S0	IN	NS1	NS0	OUT
0	0	0	0	0	1
0	0	1	0	1	1
0	1	0	0	0	0
0	1	1	1	0	0
1	0	0	0	1	0
1	0	1	1	0	0
1	1	0	X	X	X
1	1	1	X	X	X

Using K-Maps:  
 $NS1 = S0 IN + S1 IN$   
 $NS0 = S1 IN' + S1 S0' IN$   
 $OUT = S1' S0'$

4b) A=001  
 B=010  
 C=100

S2	S1	S0	IN	NS2	NS1	NS0	OUT
0	0	0	0	X	X	X	X
0	0	0	1	X	X	X	X
0	0	1	0	0	0	1	1
0	0	1	1	0	1	0	1
0	1	0	0	0	0	1	0
0	1	0	1	1	0	0	0
0	1	1	0	X	X	X	X
0	1	1	1	X	X	X	X
1	0	0	0	0	1	0	0
1	0	0	1	1	0	0	0
1	0	1	0	X	X	X	X
1	0	1	1	X	X	X	X
1	1	0	0	X	X	X	X
1	1	0	1	X	X	X	X
1	1	1	0	X	X	X	X
1	1	1	1	X	X	X	X

Using K-Maps:  
 $NS2 = S0' IN$   
 $NS1 = S2 S0' IN' + S0 IN$   
 $NS0 = S2' IN'$   
 $OUT = S2' S1'$

4c) A=00  
B=01  
C=10

S1	S0	IN	NS1	NS0	OUT
0	0	0	X	X	X
0	0	1	X	X	X
0	1	0	1	1	0
0	1	1	0	1	0
1	0	0	1	0	1
1	0	1	1	1	1
1	1	0	1	0	0
1	1	1	0	1	0

Using K-Maps:       $NS1 = IN' + S0'$   
                          $NS0 = IN + S1'$   
                          $OUT = S0'$

4d) The best implementation is 4c because it results in the least number of gates and the simplest logic.