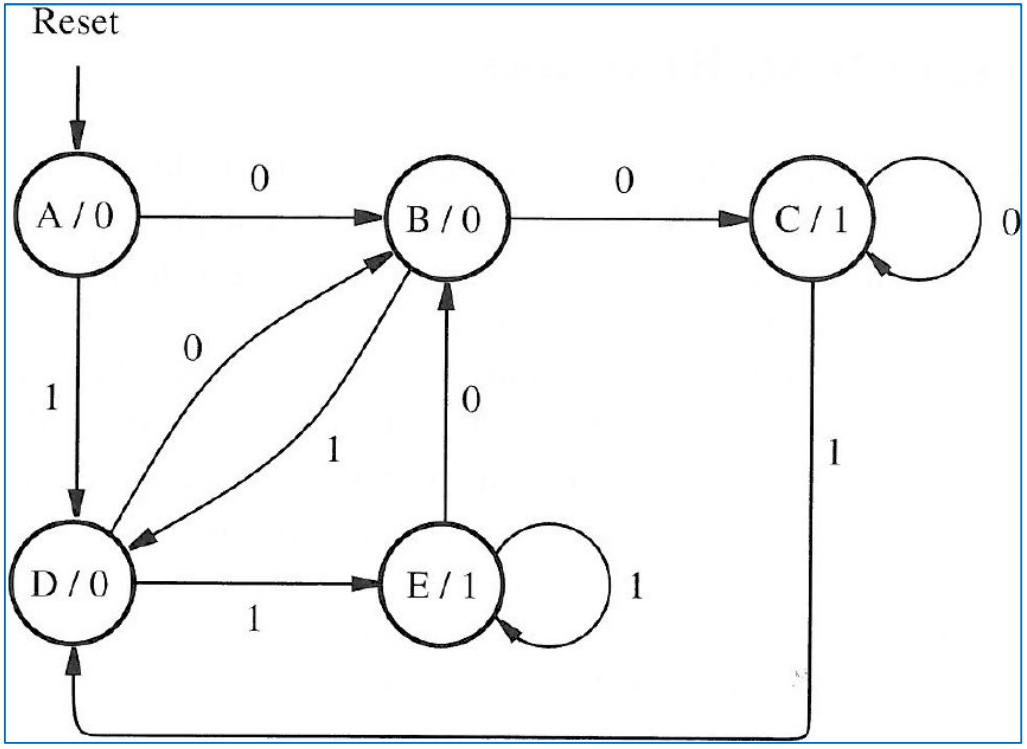
B1.

A finite state machine has an input w and an output z. The machine is a sequence detector that produces z = 1 when the previous two values of w were 00 or 11; otherwise z = 0.

(a) Draw the Moore's state diagram.
(b) Derive the state table from part (a).

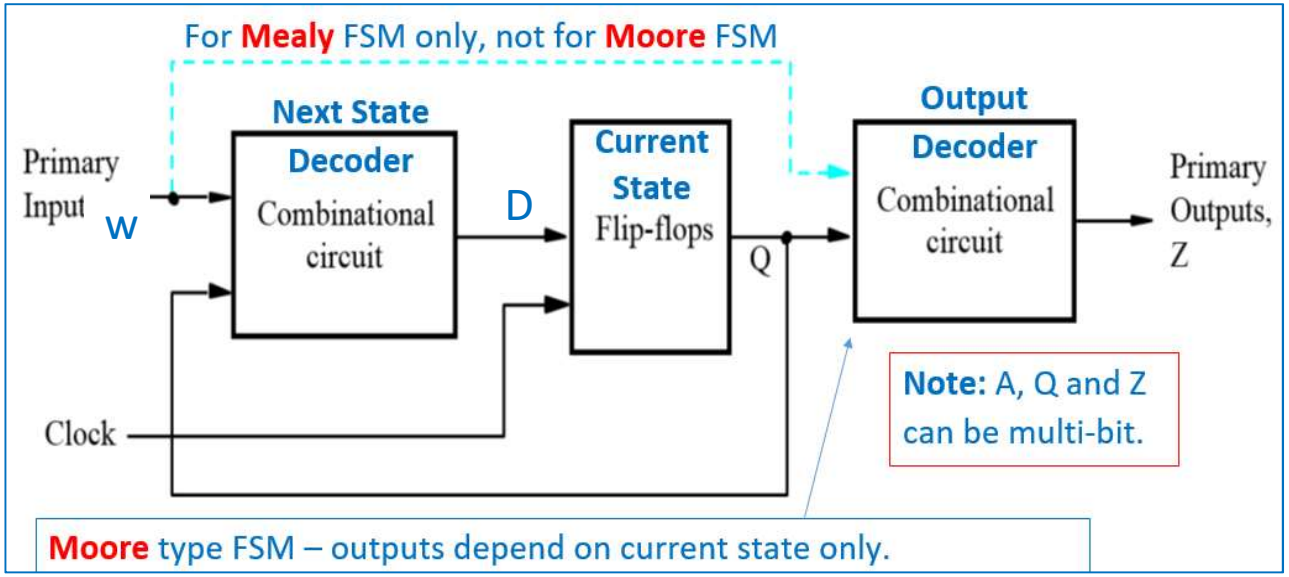


Present state	Next state		Output
	$w = 0$	$w = 1$	z
A	B	D	0
B	C	D	0
C	C	D	1
D	B	E	0
E	B	E	1

(Not required in question B1.)

Using binary state assignment (3-bit: Q1, Q2, Q3).

Present state	Next state $w = 0$	Next state $w = 1$	Output z
A000	B001	D011	0
B001	C010	D011	0
C010	C010	D011	1
D011	B001	E100	0
E100	B001	E100	1



Deriving for the Output Circuit:

State	Q1	Q2	Q3	Output Z
A	0	0	0	0
B	0	0	1	0
C	0	1	0	1
D	0	1	1	0
E	1	0	0	1
	1	0	1	x
	1	1	0	x
	1	1	1	x

Z		Q2 Q3			
		00	01	11	10
Q1	0				1
	1	1	x	x	x

$Z = Q1 + Q2.\sim Q3$

Deriving for the Next State Circuit:

State	Q1	Q2	Q3	Input w	Next State	D1	D2	D3
A	0	0	0	0	B	0	0	1
	0	0	0	1	D	0	1	1
B	0	0	1	0	C	0	1	0
	0	0	1	1	D	0	1	1
C	0	1	0	0	C	0	1	0
	0	1	0	1	D	0	1	1
D	0	1	1	0	B	0	0	1
	0	1	1	1	E	1	0	0
E	1	0	0	0	B	0	0	1
	1	0	0	1	E	1	0	0
Not used	1	0	1	0		x	x	x
	1	0	1	1		x	x	x
	1	1	0	0		x	x	x
	1	1	0	1		x	x	x
	1	1	1	0		x	x	x
	1	1	1	1		x	x	x

D1		Q3 w			
		00	01	11	10
Q1 Q2	00				
	01			1	
	11	x	x	x	x
	10		1	x	x

D1 = Q1.w + Q2.Q3.w

D2		Q3 w			
		00	01	11	10
Q1 Q2	00		1	1	1
	01	1	1		
	11	x	x	x	x
	10			x	x

D2 = Q2.~Q3 + ~Q2.Q3 + ~Q1.~Q3.w

D3		Q3 w			
		00	01	11	10
Q1 Q2	00	1	1	1	
	01		1		1
	11	x	x	x	x
	10	1		x	x

D3 =
~Q2.~Q3.~w +
~Q1.~Q3.w +
~Q1.~Q2.w +
Q2.Q3.~w