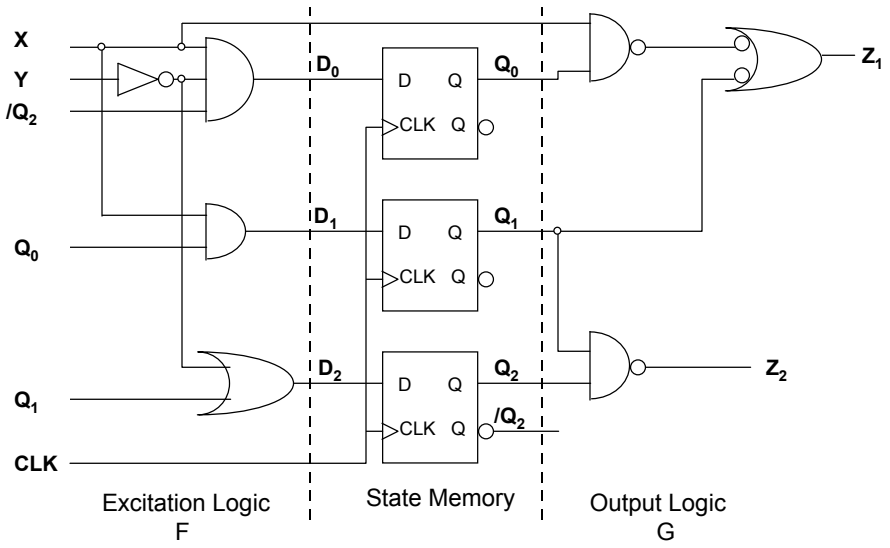
Example 2 - State Machine with D Flip-flops



Example 2 - Equations

- Excitation Equations
  $D_0 = X\ Y'\ Q_2'$
  $D_1 = X\ Q_0$
  $D_2 = Y' + Q_1$
- Characteristic Equation for D flip-flop
  $Q^* = D$
- Next State or Transition Equations
  $Q_0^* = D_0 = X\ Y'\ Q_2'$
  $Q_1^* = D_1 = X\ Q_0$
  $Q_2^* = D_2 = Y' + Q_1$

X	Y	Q_2	Q_1	Q_0
1	0	0	-	-
1	-	-	-	1
-	0	-	-	-

or

X	Y	Q_2	Q_1	Q_0
-	-	-	1	-

- Output Equations
  $Z_1 = X\ Q_0 + Q_1'$ (mealy)
  $/Z_2 = (Q_1\ Q_2)'$ (moore)
  Thus, this is a mealy machine

Example 2 - Transition / Output table

state name	Q2	Q1	Q0	XY 00	01	11	10
A=	0	0	0	100, 11	000, 11	000, 11	101, 11
B=	0	0	1	100, 11	000, 11	010, 11	111, 11
C=	0	1	0	100, 01	100, 01	100, 01	101, 01
D=	0	1	1	100, 01	100, 01	110, 11	111, 11
E=	1	0	0	100, 11	000, 11	000, 11	100, 11
F=	1	0	1	100, 11	000, 11	010, 11	110, 11
G=	1	1	0	100, 00	100, 00	100, 00	100, 00
H=	1	1	1	100, 00	100, 00	110, 10	110,10

Q2* Q1* Q0*, Z1 /Z2
(Next State, Outputs)

Transition Equations

Q0* = D0 = X Y' Q2'

Q1* = D1 = X Q0

Q2* = D2 = Y' + Q1

Output Equations

Z1 = X Q0 + Q1'

/Z2= (Q1 Q2)'

X Y Q2 Q1 Q0

1 0 0 - -

1 - - - 1

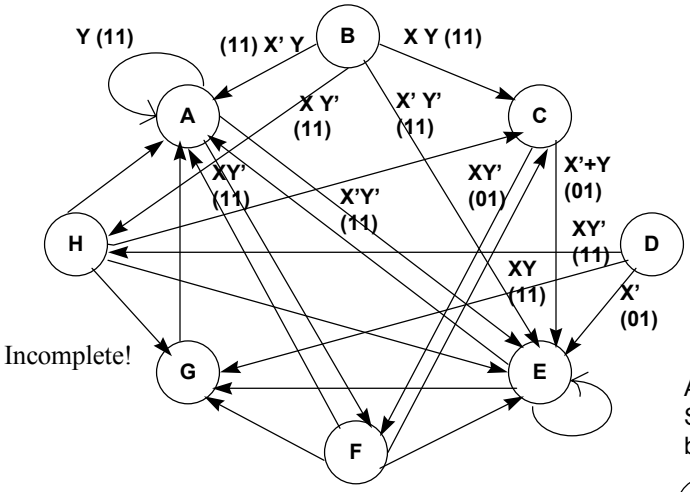
- 0 - - - or - - - 1 -

Example 2 - State / Output table

S	XY 00	01	11	10
A	E, 11	A, 11	A, 11	F, 11
B	E, 11	A, 11	C, 11	H, 11
C	E, 01	E, 01	E, 01	F, 01
D	E, 01	E, 01	G, 11	H, 11
E	E, 11	A, 11	A, 11	E, 11
F	E, 11	A, 11	C, 11	G, 11
G	E, 00	E, 00	E, 00	E, 00
H	E, 00	E, 00	G, 10	G,10

S*, Z1 /Z2

Example 2 - State Diagram



Different format
Arc: input expression (outputs) = xy (Z1 /Z2)

Also possible:
Same transition,
but different outputs