

March 31, 2017

# Sequential circuit

(1)

① Analysis

Synthesis ②

step 1: A circuit is given →

goal:  
Determine what  
does it do?

step 2: How many FFs are  
~~needed to~~ there?

~~What~~ Explain its  
function or  
operation.

1 FF → 1 bit

Storage/memory  
"State"

step 3: Obtain FF input "equations."

step 4: Use these equations to derive the  
"State table"

step 5: From the State table to  
"State diagram"

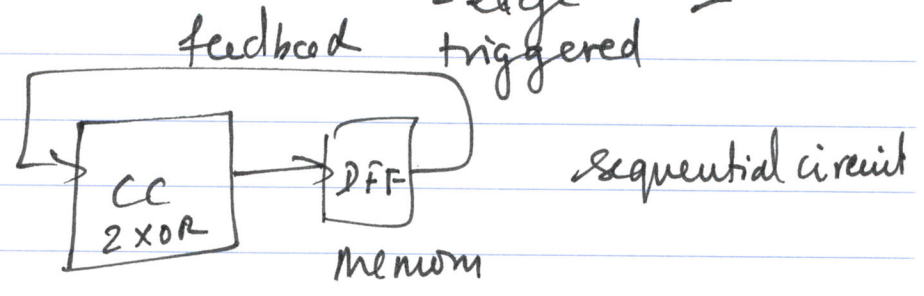
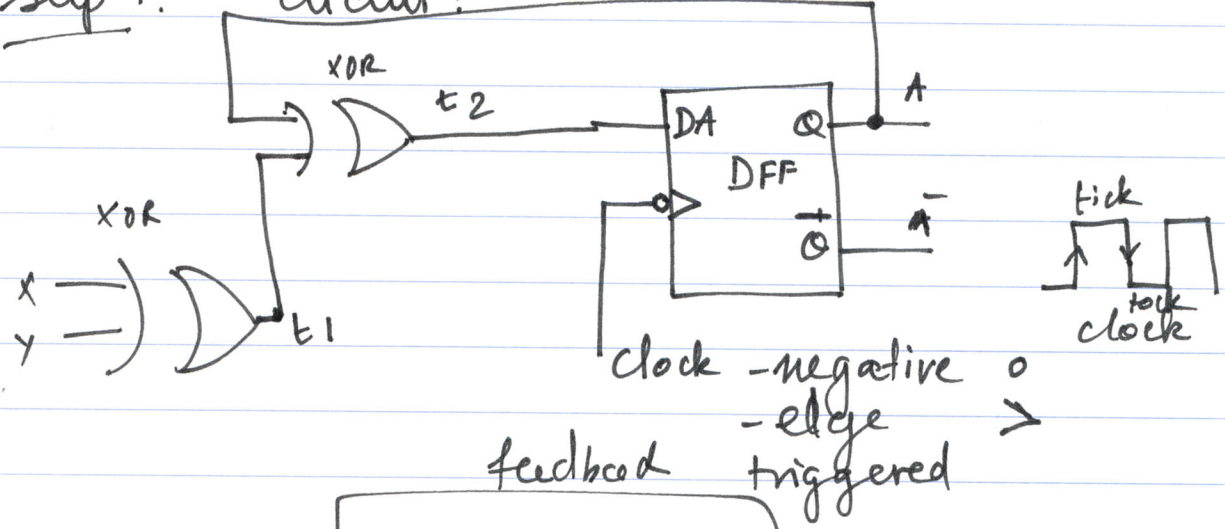
step 6: word explanation.

D-FF → E-FF → JK-FF

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step 1:

circuit:



step 2

How many FF? what FF?  
1 FF, D-FF

step 3:

FF input equation? FF is driven or activated by a CC

$DA = ? \quad t1 = X \oplus Y$

$t2 = X \oplus Y \oplus A$

step 4

state table

| current state<br>A(t) | inputs |   | FF input<br>DA | next state<br>A(t+1) |
|-----------------------|--------|---|----------------|----------------------|
|                       | X      | Y |                |                      |
| 0<br>S0               | 0      | 0 | 0              | 0                    |
|                       | 0      | 1 | 1              | 1                    |
|                       | 1      | 0 | 1              | 1                    |
|                       | 1      | 1 | 0              | 0                    |
| 1<br>S1               | 0      | 0 | 1              | 1                    |
|                       | 0      | 1 | 0              | 0                    |
|                       | 1      | 1 | 1              | 1                    |

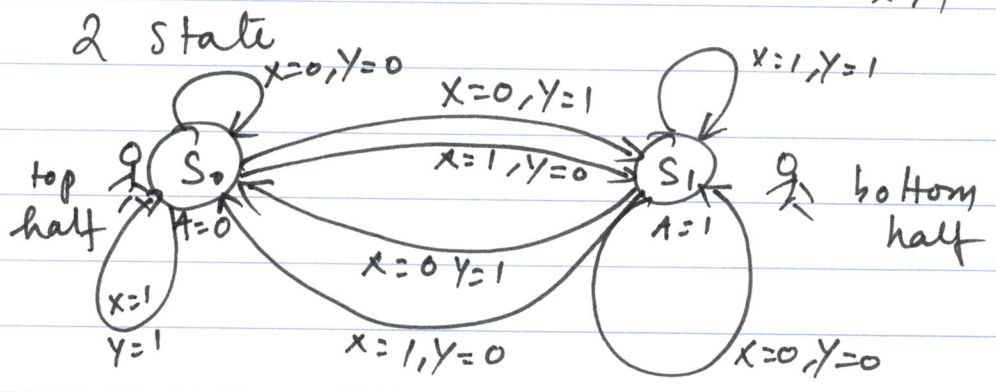
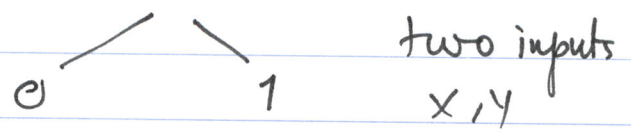
step 5  
Draw the state diagram:  
Finite state Machine FSM

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steps: FSM state machine

1 - DFF 1 bit



steps word explanation

State changes only when the inputs x and y are different

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## ~~Step~~ ~~System~~ Synthesis of sequential circuit:

1. Problem statement given  
↓
2. Determine the # of bits needed to represent the problem
3. # of bits  $\Rightarrow$  # of FFs
4. draw the state diagram or finite state machine (FSM)
5. Decide on the type of FF (T, D, JK)
6. ~~use~~ Draw the state table
7. Derive the FF input equations
8. Draw or Build the sequential ~~circuit~~ circuit.