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## CMPE 240 Experiment 4 Preliminary Work

### Step 1

State the inputs and outputs of the state registers.

$\Rightarrow$  Inputs:  $n_2, n_1, n_0,$

$\Rightarrow$  Outputs:  $s_2, s_1, s_0,$

### Step 2

State the inputs and outputs of the combinational block of the sequential circuit.

$\Rightarrow$  Inputs:  $s_2, s_1, s_0, x$

$\Rightarrow$  Outputs:  $n_2, n_1, n_0, y_1, y_0$

### Step 3

Write each output (including next state bits) as a function of the inputs.

$$n_2 = xs_2s'_1s'_0 + xs'_2s_1s_0$$

$$n_1 = xs'_2s'_1s_0 + xs'_2s_1s'_0$$

$$n_0 = x's_2s'_1s'_0 + x's'_2 + xs'_2s_1s'_0$$

$$y_1 = x's_2s'_1s'_0 + x's'_2s_1s_0$$

$$y_0 = x's_2s'_1s'_0 + x's'_2s_1s'_0$$

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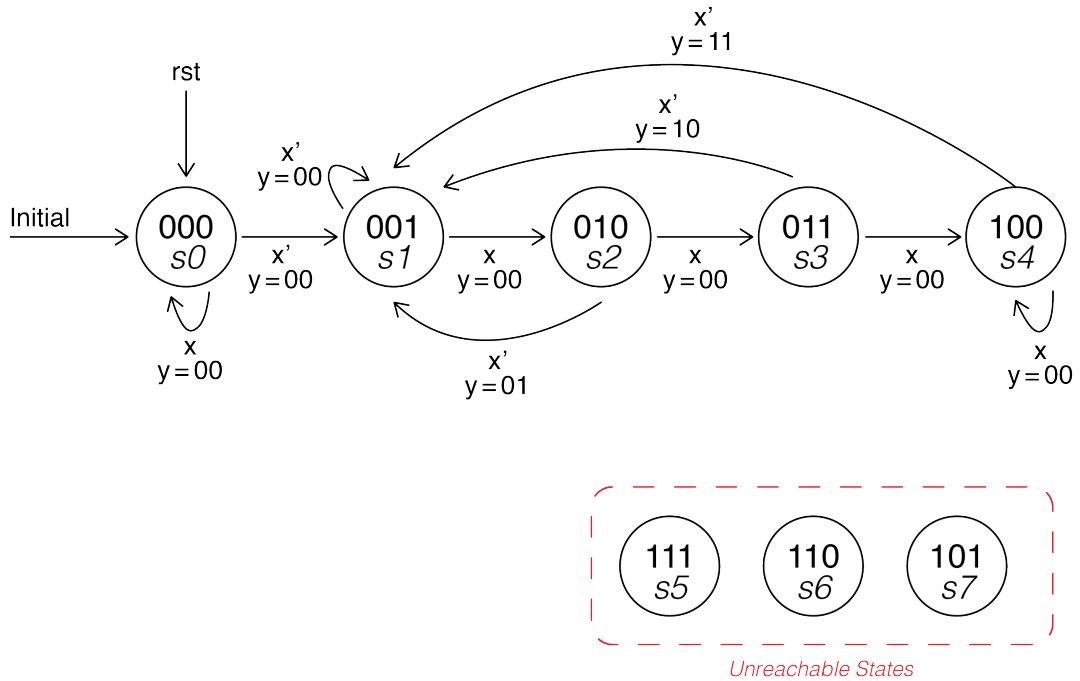
## Step 4

Draw the truth table for the combinational circuit.

#	S2	S1	S0	X	N2	N1	N0	Y1	Y0
0	0	0	0	0	0	0	1	0	0
1	0	0	0	1	0	0	0	0	0
2	0	0	1	0	0	0	1	0	0
3	0	0	1	1	0	1	0	0	0
4	0	1	0	0	0	0	1	0	1
5	0	1	0	1	0	1	1	0	0
6	0	1	1	0	0	0	1	1	0
7	0	1	1	1	1	0	0	0	0
8	1	0	0	0	0	0	1	1	1
9	1	0	0	1	1	0	0	0	0
10	1	0	1	0	0	0	0	0	0
11	1	0	1	1	0	0	0	0	0
12	1	1	0	0	0	0	0	0	0
13	1	1	0	1	0	0	0	0	0
14	1	1	1	0	0	0	0	0	0
15	1	1	1	1	0	0	0	0	0

## Step 5

Draw the finite state machine by using the truth table.



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## Step 6

How many unreachable states does the finite state machine contain? (No explanation, only short answer).

⇒ # of Unreachable States: 3

## Step 7

Briefly explain the relation between the input and the output.

⇒ Explanation: In this FSM, output depends not solely on the state but also on the given input. What it does is this: after a start with 0 it counts the number of consecutive 1's up to 3 with start and end with 0 (like 0110). If the count is 0, outputs 0; if the count is 1, output is 01; if the count is 2, output is 10 and if the count is 3, output is 11. If the count is greater than 1, it also outputs 11.