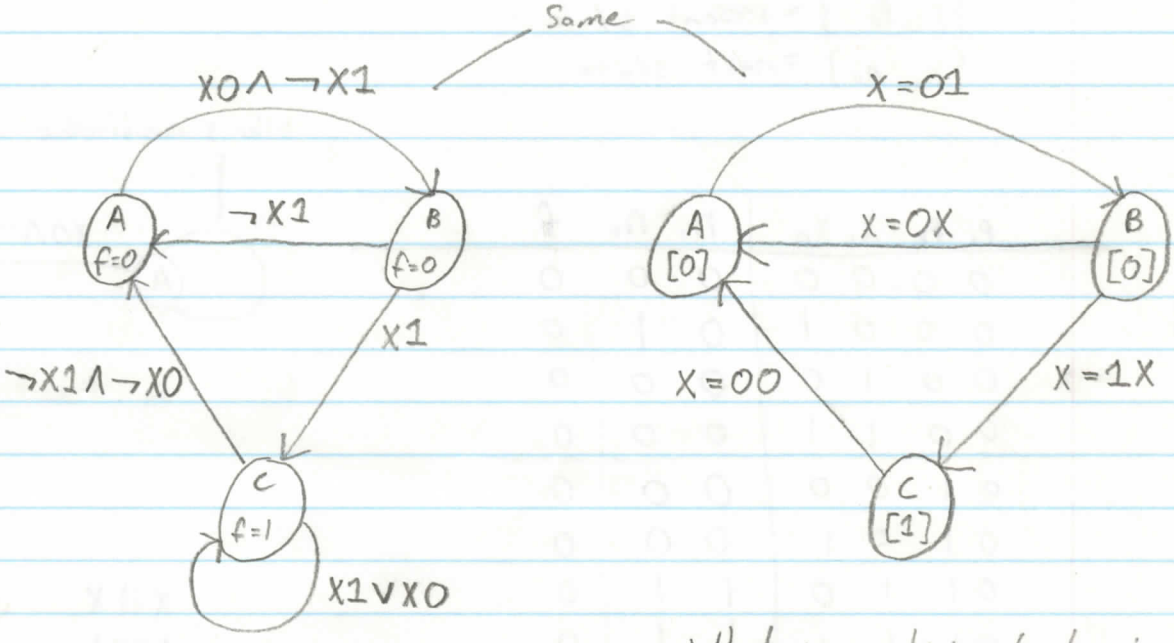
Sequential Logic Flipped Lecture

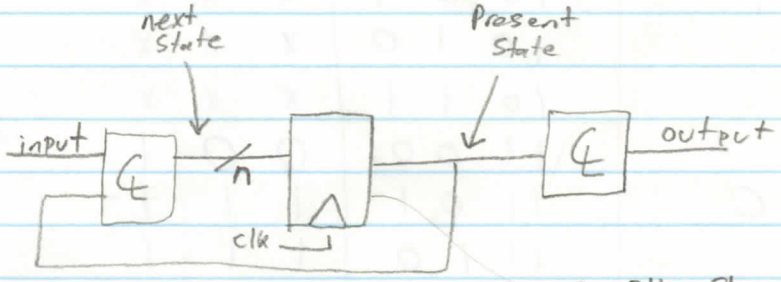
Q3: Create a digital circuit that implements the following finite state machine using a binary code for the states. Put your final answer in the form of a logic diagram using logic gates



What were trying to do:

SOLUTION

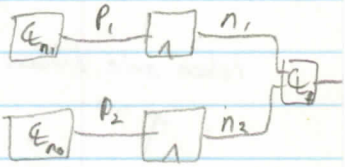
Notes:
- Circles are states
- arrows are edges
- X0 and X1 are inputs



△ = Flip Flop

"Transition on rising edge of the clock"

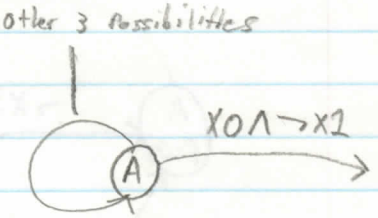
2 Flip Flops



Step 1: State assignment

A: 00
B: 01
C: 11

$\{P_1, P_0\}$ = present state
$\{n_1, n_0\}$ = next state



	P_1	P_2	X_1	X_0	n_1	n_0	f
A	0	0	0	0	0	0	0
	0	0	0	1	0	1	0
	0	0	1	0	0	0	0
	0	0	1	1	0	0	0
B	0	1	0	0	0	0	0
	0	1	0	1	0	0	0
	0	1	1	0	1	1	0
	0	1	1	1	1	1	0
?	1	0	0	0	x	x	x
	1	0	0	1	x	x	x
	1	0	1	0	x	x	x
	1	0	1	1	x	x	x
C	1	1	0	0	0	0	1
	1	1	0	1	1	1	1
	1	1	1	0	1	1	1
	1	1	1	1	1	1	1

X11X
1xx1
↑

n_1 \ X_1X_0	00	01	11	10
00	0	0	0	0
01	0	0	1	1
11	0	1	1	1
10	X	X	X	X

reduce gate diagram
↑
Same as n_1 X001

n_0 \ P_1P_2	00	01	11	10
00	0	1	0	0
01	0	0	1	1
=	0	1	1	1
10	x	x	x	x

f \ P_1P_2	00	01	11	10
00	0	0	0	0
01	0	0	0	0
=	1	1	1	1
10	x	x	x	x

1xxx

A = 00
B = 01
C = 11
D = 10

Truth table

	P_1	P_2	u	v	n_1	n_2	s	t
A	0	0	0	0	0	1	X	X
	0	0	0	1	1	0	1	1
	0	0	1	0	1	1	1	X
	0	0	1	1	0	0	X	0
B	0	1	0	0	1	1	0	0
	0	1	0	1	0	1	X	0
	0	1	1	0	1	1	0	0
	0	1	1	1	0	1	X	0
D	1	0	0	0	1	0	1	0
	1	0	0	1	1	0	1	0
	1	0	1	0	0	1	0	0
	1	0	1	1	0	0	0	1
C	1	1	0	0	1	1	0	0
	1	1	0	1	1	1	0	0
	1	1	1	0	1	1	0	0
	1	1	1	1	1	1	0	0