Controlled Input

CLASS 18

CONTROLLERS (CONTROLLED INPUT)

Problem

Let A be an input ('external'-we are not interested in its value), and Y the output of this control circuit.

We need to sometimes produce Y = A, and at other times produce Y = A'. We will use a control line called C. What is special about controllers is that we use the control line(s) as input, and not the 'external' input, which we want to control, in this case A, when setting the truth table..

Solution

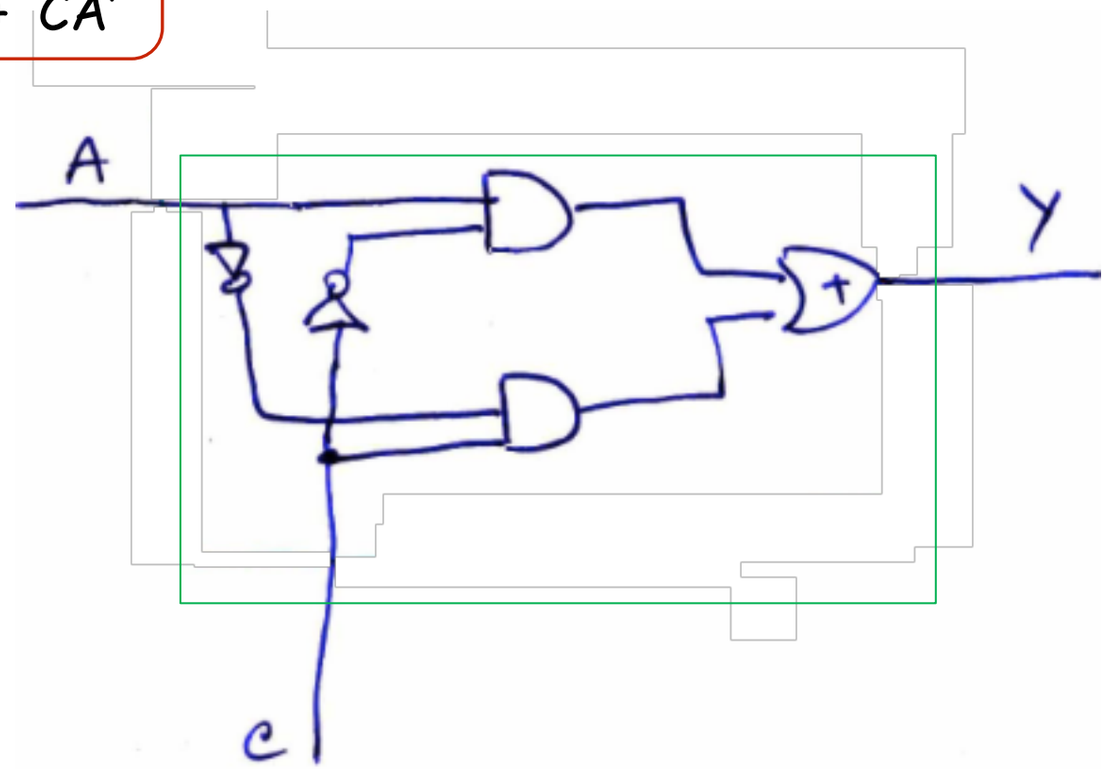
Truth table: Input = Control Line(s)

C	Y
0	A
1	A'

Expression of function:

$Y = C'A + CA'$

Logic diagram:



CONTROLLED INPUT (continued)

Problem

* Input (external): A
* Output Y should equal:
  - * at times A
  - * at other times A'
  - * yet at other times 0
  - * yet at other times 1

Solution

How many different outputs do we have? 4 How many controllers do we need to create the 4 different outputs? 2

Truth table:

α	β	Y
0	0	A
0	1	A'
1	0	0
1	1	1

$Y = \alpha'\beta'A + \alpha'\beta A' + \cancel{\alpha\beta'0} + \alpha\beta$

$Y = \alpha'\beta'A + \alpha'\beta A' + \alpha\beta$

CONTROLLED INPUT (continued)

MULTIPLEXER

* 4 inputs (external): $I_0, I_1, I_2, I_3,$

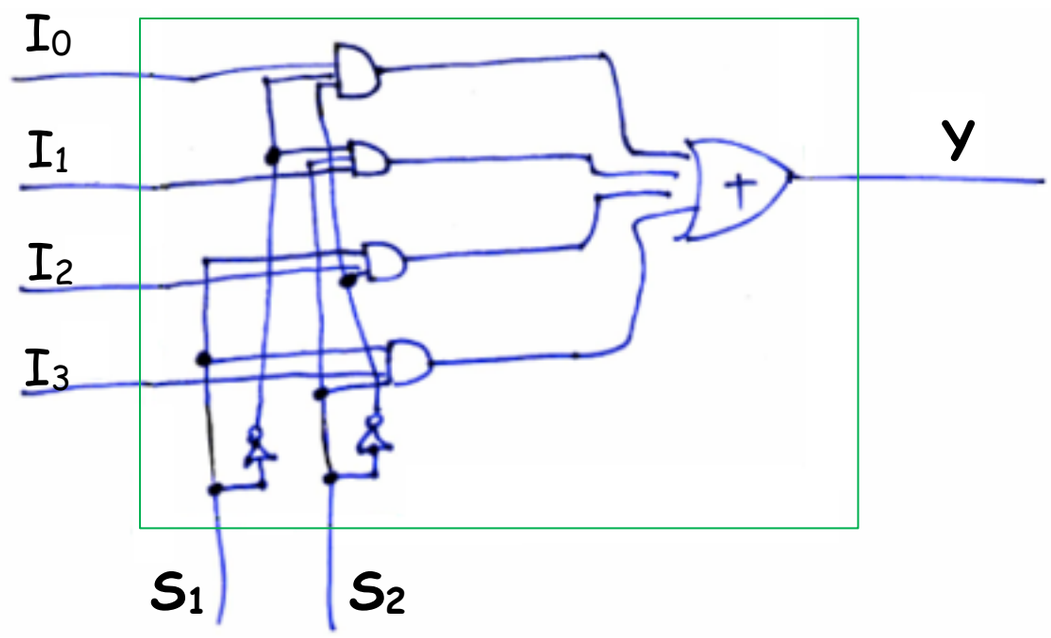
* 1 output: Y = { * at times I_0 ; * at other times I_1 ; * yet at other times I_2 ; * yet at other times I_3

How many controllers do we need to create the 4 different outputs? 2

Let's call them 'selectors' in this case: S_1, S_2

S_1	S_2	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

$$Y = S'_1S'_2I_0 + S'_1S_2I_1 + S_1S'_2I_2 + S_1S_2I_3$$



CONTROLLED INPUT (continued)

DEMULTIPLEXER

* 1 input (external): **I**

* 4 outputs: Y_0, Y_1, Y_2, Y_3, as follows:

S_1	S_2	Y_0	Y_1	Y_2	Y_3
0	0	I	0	0	0
0	1	0	I	0	0
1	0	0	0	I	0
1	1	0	0	0	I

How many controllers do we need to create the 4 different outputs for the 4 functions)? 2

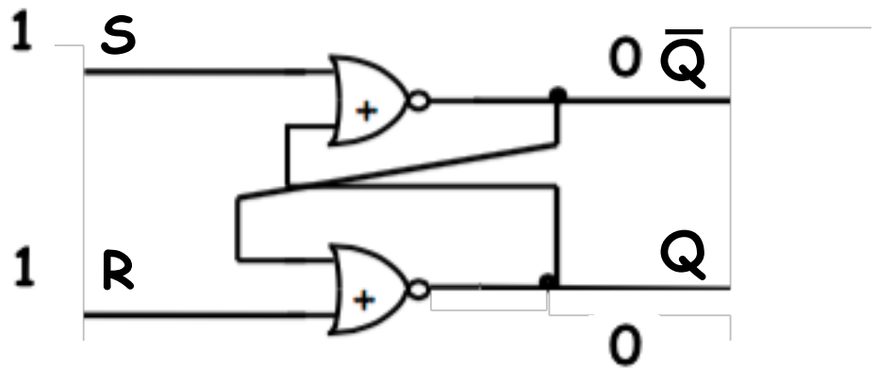
$Y_0 = S'_1S'_2I$

$Y_1 = S'_1S_2I$

$Y_2 = S_1S'_2I$

$Y_3 = S_1S_2I$

S-R FLIP-FLOP (set-reset)



Truth table:

S	R	Q	$\overline{Q}$
0	0	PS = 0 -->stays 0 PS = 1 -->stays 1 } PS	PS
0	1	0	1
1	0	1	0
1	1	0	0

PS stands for Previous State

Not allowed !

Exclude the 1-1 input for S–R Flip-Flop, as we cannot have Q = $\overline{Q}$, and we want complementary outputs!

The **truth table** becomes:

S	R	Q
0	0	PS
0	1	0
1	0	1

HW 18 - assigned

Evaluate the following flip-flop, by giving its truth table.