Homework 6

B.10

> Prove that a two-input multiplexor is also universal by showing how to build the NAN (or NOR) gate using a multiplexor.

Answer:

NAND

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

NOR mapped to a multiplexor

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

A = the selector and c = the output

NAND in Multiplexor form

A	C
0	1
1	$\overline{B}$

B.12

> Implement the four functions described in exercise B.11 using a PLA.

Answer:

x2	x1	x0	One 1	Even 1s	Unsigned X < 3	Signed X < -1	X's Signed Value
0	0	0	0	1	1	0	0
0	0	1	1	0	1	0	1
0	1	0	1	0	1	0	2
0	1	1	0	1	0	1	-4
1	0	1	0	1	0	1	-3
1	1	0	0	1	0	1	-2
1	1	1	0	0	0	0	-1

B.14

> Implement a switching network that has two data inputs (A and B), two data outputs (C and D), and a control input (S). if S equals 1, the network is in pass-through mode, and Cshould equal A, and D should equal B. if S equals 0, the network is in crossing mode, and C should equal B, and D should equal A

Answer:

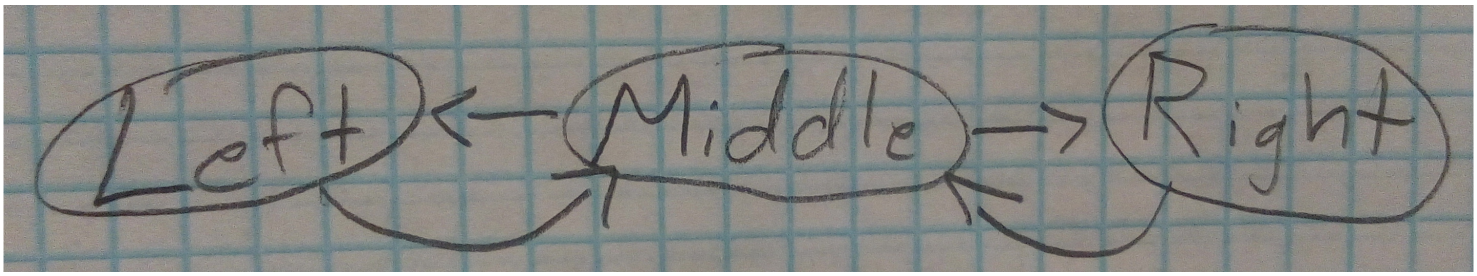
C = A'BS' + AB'S + ABS' + ABS

D = A'BS + AB'S' + ABS' + ABS

B.37

> A friend would like you to buy an "electronic eye" for use as a fake security device. The deice consists of three lights lined up in a row, controlled by the outputs left, Middle, and Right, which, if asserted, indicate that a light should be on. Only one light is on at a time, and the light "moves" from left to right and then from right to left, thus scaring away thieves who believe that the device is monitoring their ectivity. Draw the graphical representation for the finite-state machine used to speify the electronic eye. Not that the rate of the eye's movement will be controlled by hte clock speed (which should not be too great) and that there are essentially no inputs.

Answer:

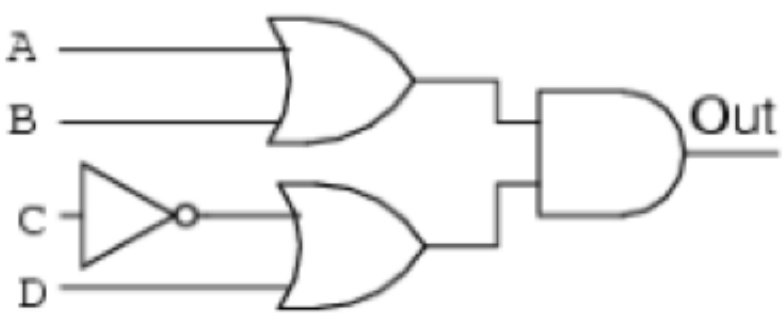


B.38

> Assign state numbers to the states of the finite-state machine you constructed for Exercise B.37 and write a set of logic equations for each of the outputs, including the next-state bits.

Answer:

Figure 1



1

> Write a product of sums equation to represent the circuit in figure 1

Answer:

$$(A+B)(\overline{C}+D)$$

2

> Write a Truth table to represent the circuit in figure 1

Answer:

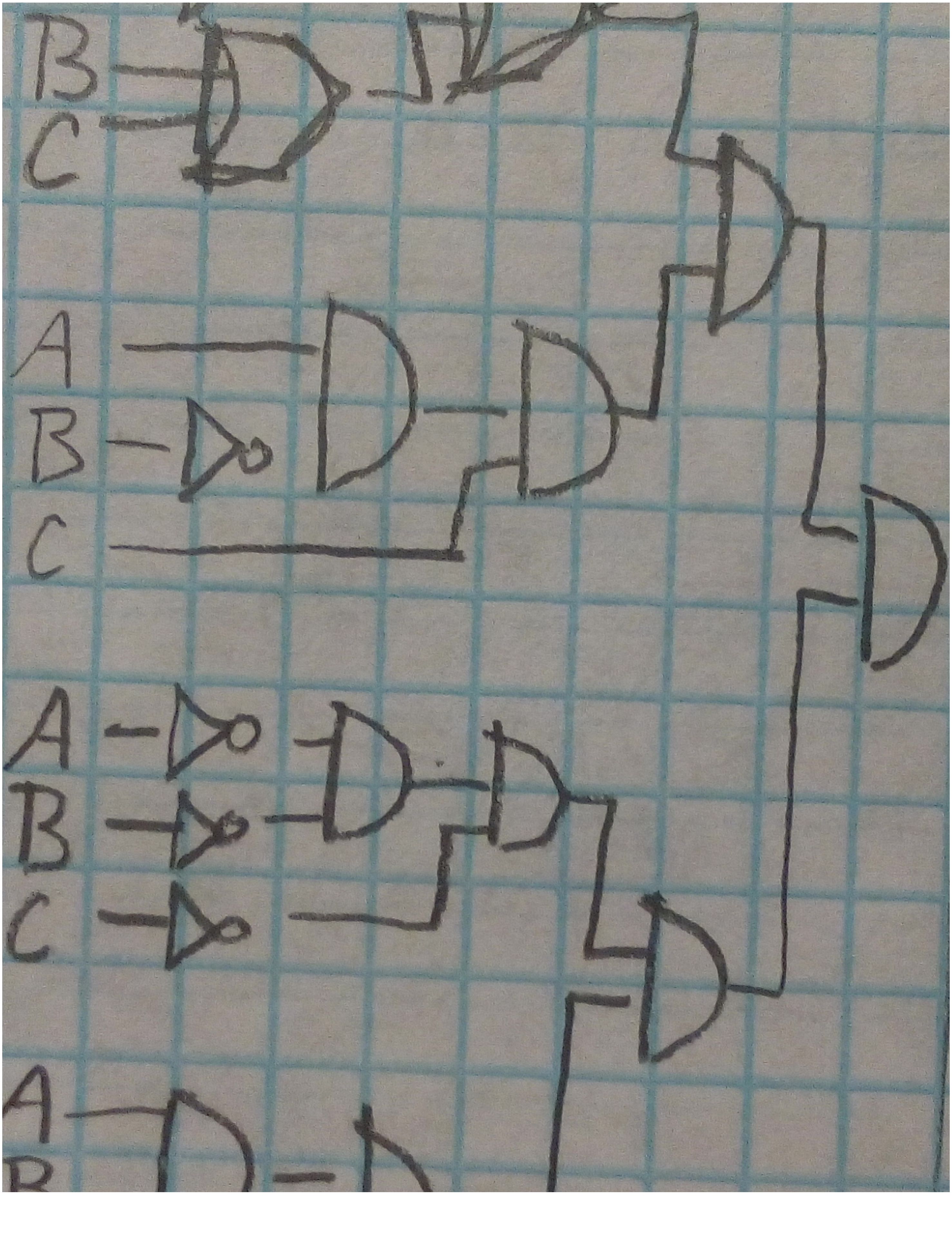
A	B	C	D	F
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	0
1	1	1	1	1

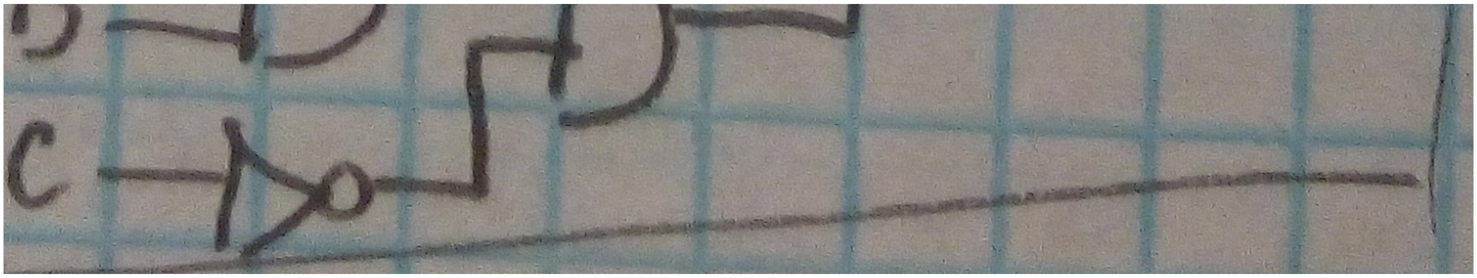
3

$Y = \overline{A}BC + A\overline{B}C + \overline{ABC} + AB\overline{C}$

> Given the following sum of products equation draw a logic diagram using gates

Answer:


B
C
A
B
C
A
B
C
A



C