

# Homework #1 ECE 461 / 661

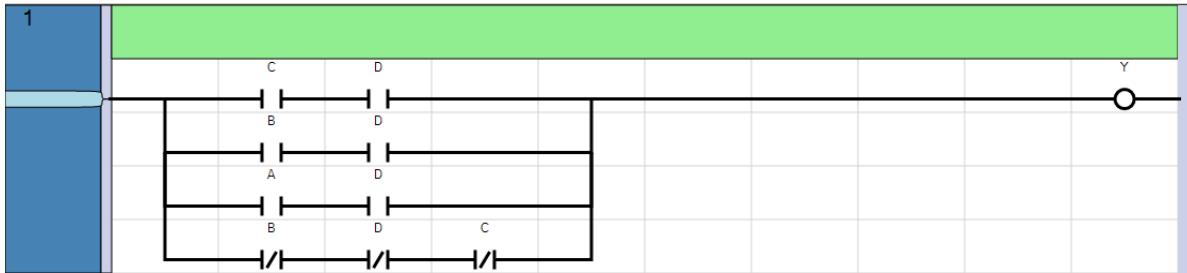
Ladder Logic. Due Monday, August 27th

1) Write a Ladder Logic program to implement the following logic function:  $Y = f(A,B,C,D)$

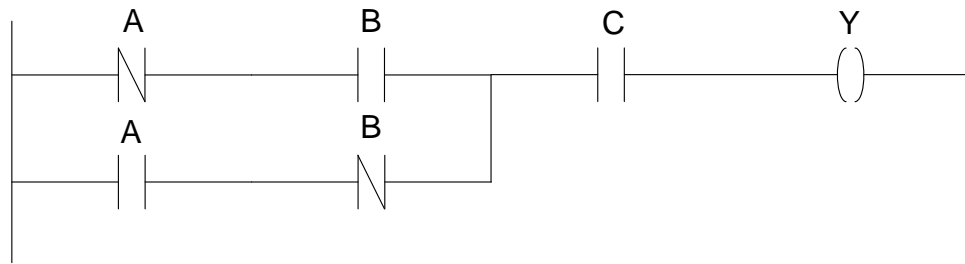
		CD			
		00	01	11	10
Y	00	1	0	1	0
	01	0	1	1	0
	11	0	1	1	0
	10	1	1	1	0

$$Y = CD + BD + AD + \overline{BCD}$$

Series is and, parallel is or



2) Determine the logic function which corresponds to the following ladder logic program:



$$Y = C \cdot (\bar{A}B + A\bar{B})$$

3) Write a ladder logic program to meet the following requirements:

I/O:

- Input: Button A, B, C, D (renamed)
- Output: R (red) and G (green)

How they relate:

- If no buttons are pressed, both lights are off. Otherwise,
- If an even number of buttons are pressed, the red light turns on and the green light is off.
- If an odd number of buttons are pressed, the green light is on and the red light is off.

R (even)

	00	01	11	10
00	0	0	1	0
01	0	1	0	1
11	1	0	1	0
10	0	1	0	1

G (odd)

	00	01	11	10
00	0	1	0	1
01	1	0	1	0
11	0	1	0	1
10	1	0	1	0

This gives

$$R = A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + A\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + ABCD$$

$$G = A\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}D + ABC\bar{D} + AB\bar{C}D + \bar{A}BCD + \bar{A}BCD$$

With ladder logic

