

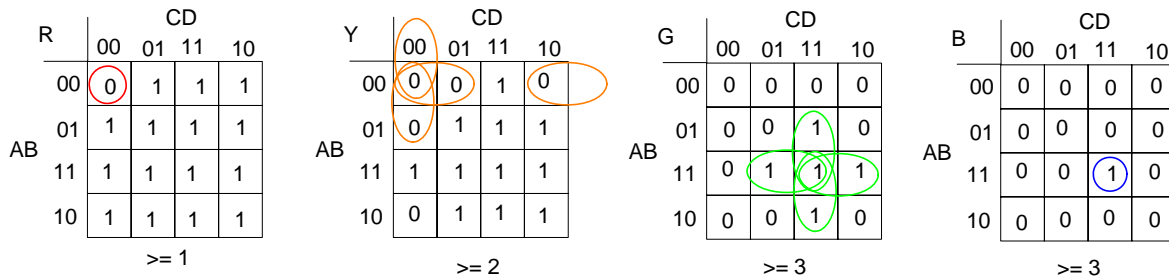
Homework #1 ECE 461

PLC: Combinational Logic. Due Monday, August 29th

Write a program which displays how many buttons are pressed (input 0 to 3).

# Buttons Pressed	DO-0 (red)	DO-1 (yellow)	DO-2 (green)	DO-3 (blue)
0	0	0	0	0
1	1	0	0	0
2	1	1	0	0
3	1	1	1	0
4	1	1	1	1

1) Give a Karnaugh map for each output (red / yellow / green / blue)



Note: You can circle the ones or zeros.

- If you circle the ones, the output is Y (normally open relay)
- If you circle the zeros, the output is not Y (normally closed relay)

2) Determine the combinational logic for each output

$$\overline{Red} = \overline{A}\overline{B}\overline{C}\overline{D}$$

$$Red = A + B + C + D \quad (\text{DeMorgan's Law})$$

$$\overline{Yellow} = \overline{A}\overline{B}\overline{C} + \overline{A}\overline{B}\overline{D} + \overline{A}\overline{C}\overline{D} + \overline{B}\overline{C}\overline{D}$$

$$Yellow = (A + B + C)(A + B + D)(A + C + D)(B + C + D)$$

$$Green = ABC + ABD + ACD + BCD$$

$$Blue = ABCD$$

3) Write a ladder-logic program for this.

