

# ECE M16 Homework 2

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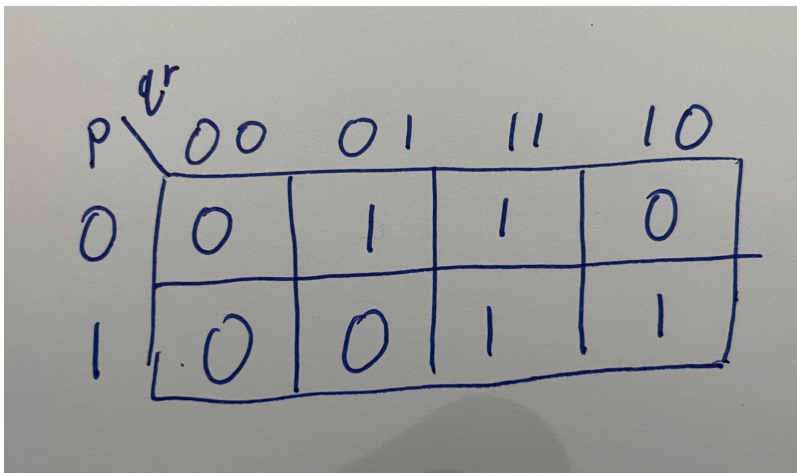
July 14, 2022

## HW1

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### Problem 4

part b



A handwritten truth table for a 2-input function. The inputs are labeled  $p$  and  $q$ . The outputs are labeled 0 and 1. The table is a 2x4 grid with columns for  $00$ ,  $01$ ,  $11$ , and  $10$ . The rows are for  $0$  and  $1$ .

| $p \backslash q$ | $00$ | $01$ | $11$ | $10$ |
|------------------|------|------|------|------|
| $0$              | $0$  | $1$  | $1$  | $0$  |
| $1$              | $0$  | $0$  | $1$  | $1$  |

## Problem 7

(a)

| Month | m3 | m2 | m1 | m0 | output |
|-------|----|----|----|----|--------|
| 1     | 0  | 0  | 0  | 1  | 1      |
| 2     | 0  | 0  | 1  | 0  | 0      |
| 3     | 0  | 0  | 1  | 1  | 1      |
| 4     | 0  | 1  | 0  | 0  | 0      |
| 5     | 0  | 1  | 0  | 1  | 1      |
| 6     | 0  | 1  | 1  | 0  | 0      |
| 7     | 0  | 1  | 1  | 1  | 1      |
| 8     | 1  | 0  | 0  | 0  | 1      |
| 9     | 1  | 0  | 0  | 1  | 0      |
| 10    | 1  | 0  | 1  | 0  | 1      |
| 11    | 1  | 0  | 1  | 1  | 0      |
| 12    | 1  | 1  | 0  | 0  | 1      |

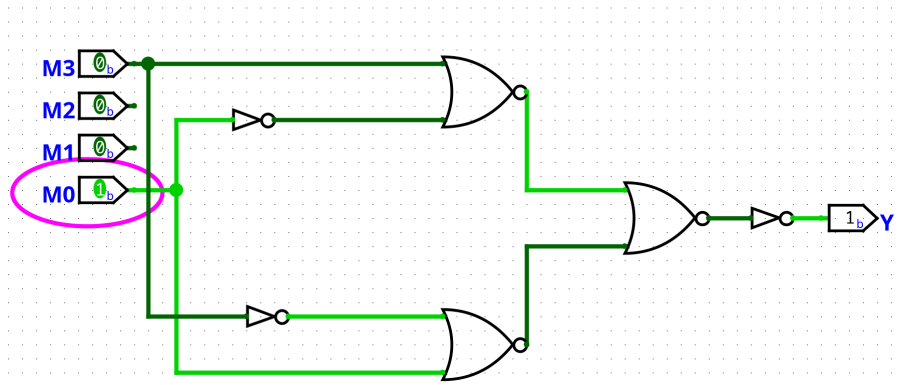
(b)

| m1 \ m0 | 0 | 1 | 2 | 3 |
|---------|---|---|---|---|
| 0       | 1 | 0 | 1 | 0 |
| 1       | 0 | 1 | 0 | 0 |
| 2       | 0 | 0 | 0 | 1 |
| 3       | 0 | 0 | 0 | 1 |

Therefore the equation is:

$$m_0 \cdot \overline{m_3} + \overline{m_0} \cdot m_3$$

(c)

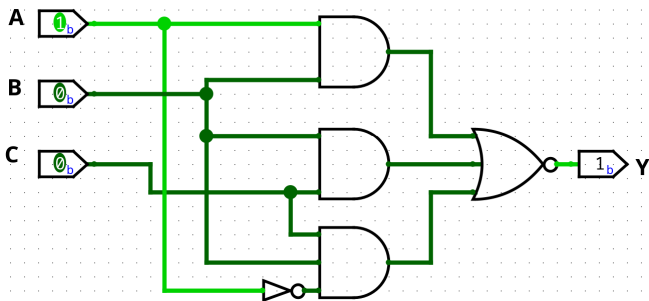


## HW 2

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### Problem 1

There would be a static 0 hazard between  $b = 1, c = 1, a = 0$  and  $b = 1, c = 1, a = 1$ . We can fix it with the following circuit. We can fix this by adding an And gate between  $b$  and  $c$  before the nor, so the resulting function would look like this



### Problem 2

Let the inputs be  $M[0 : 3]$  then we have the following truth table

| decimal | M3 | M2 | M1 | M0 | q2 | q5 |
|---------|----|----|----|----|----|----|
| 0       | 0  | 0  | 0  | 0  | 1  | 1  |
| 1       | 0  | 0  | 0  | 1  | 0  | 1  |
| 2       | 0  | 0  | 1  | 0  | 1  | 1  |
| 3       | 0  | 0  | 1  | 1  | 0  | 1  |
| 4       | 0  | 1  | 0  | 0  | 0  | 1  |
| 5       | 0  | 1  | 0  | 1  | 0  | 0  |
| 6       | 0  | 1  | 1  | 0  | 1  | 0  |
| 7       | 0  | 1  | 1  | 1  | 0  | 1  |
| 8       | 1  | 0  | 0  | 0  | 1  | 1  |
| 9       | 1  | 0  | 0  | 1  | 0  | 1  |

Therefore we will have the following Kmap for q2

|          |    |               |    |    |    |
|----------|----|---------------|----|----|----|
|          |    | $q2$ $M1, M0$ |    |    |    |
|          |    | 00            | 01 | 11 | 10 |
| $M3, M2$ | 00 | 1             | 0  | 0  | 1  |
|          | 01 | 0             | 0  | 0  | 1  |
|          | 11 | -             | -  | -  | -  |
|          | 10 | 1             | 0  | -  | -  |

Therefore the equation for q2 is:

$$q2 = \overline{M2} \cdot \overline{M0} + M1 \cdot \overline{M0}$$

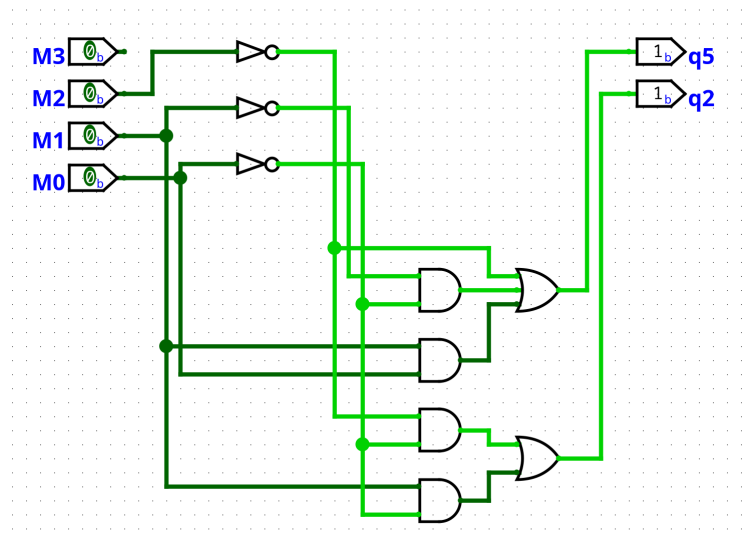
Likewise, the Kmap for q5 is

|          |    |               |    |    |    |
|----------|----|---------------|----|----|----|
|          |    | $q5$ $M1, M0$ |    |    |    |
|          |    | 00            | 01 | 11 | 10 |
| $M3, M2$ | 00 | 1             | 1  | 1  | 1  |
|          | 01 | 1             | 0  | 1  | 0  |
|          | 11 | -             | -  | -  | -  |
|          | 10 | 1             | 1  | -  | -  |

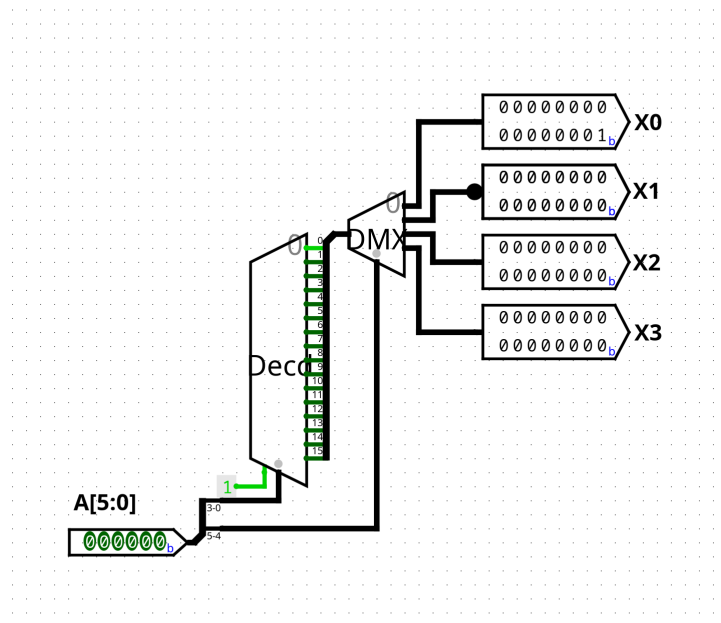
Therefore the equation for q5 is:

$$q5 = \overline{M2} + \overline{M1} \cdot \overline{M0} + M1 \cdot M0$$

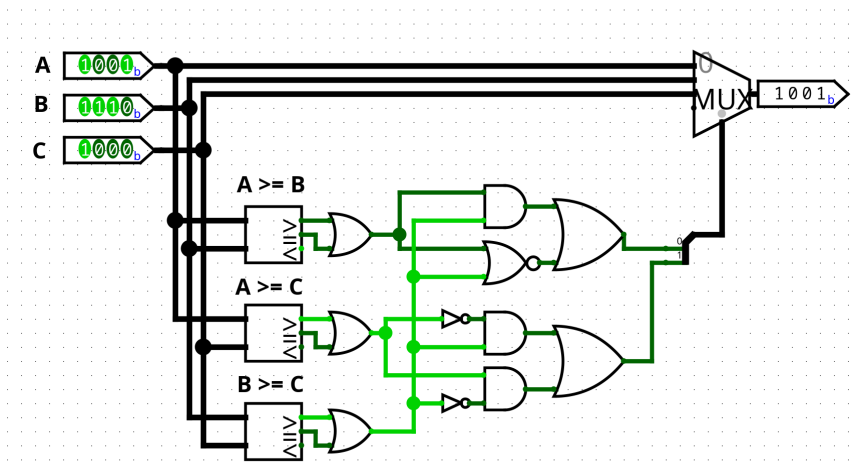
Therefore the resulting circuit is



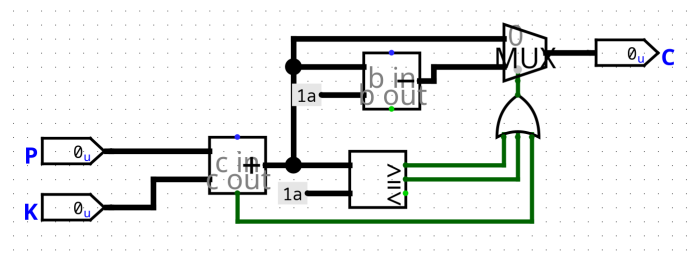
### Problem 3



## Problem 4



## Problem 5



## Problem 6

