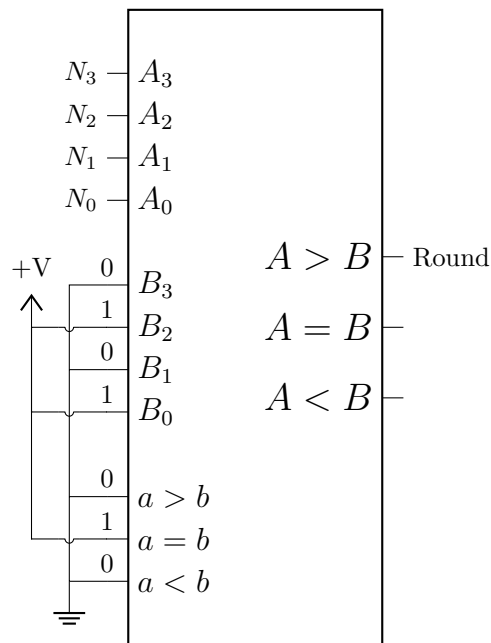# ECE 2300
Digital Logic Design

Homework 6

Choi Tim Antony Yung

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1 Using a magnitude comparator, generate a logic one "Round" signal (to round a number up by one) if the base **12** input, $N = N_3, N_2, N_1, N_0$, is six or higher. Let N connect to the comparator's A input.
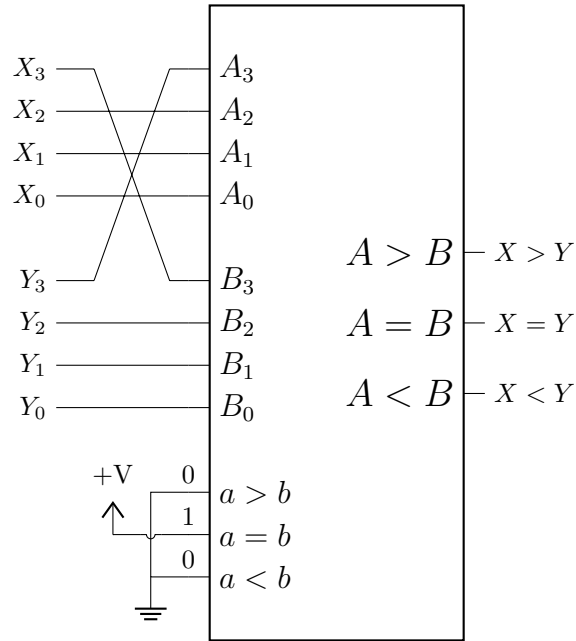
$$Round = N > 5 = (0101)_2$$

2   **A simple mechanism moves between positions $P = (0000)_2$ and $P = (1111)_2$. Using a magnitude comparator, generate an enable signal, MV_OK, that is one if the position, P, is 12 or lower or if it is three or higher.**

P_3		Threshold			Relationship
0	0	0	1	0	P valid if greater than threshold
1	1	1	0	1	P valid if less than threshold
	P_3	P_3	$\overline{P_3}$	P_3	
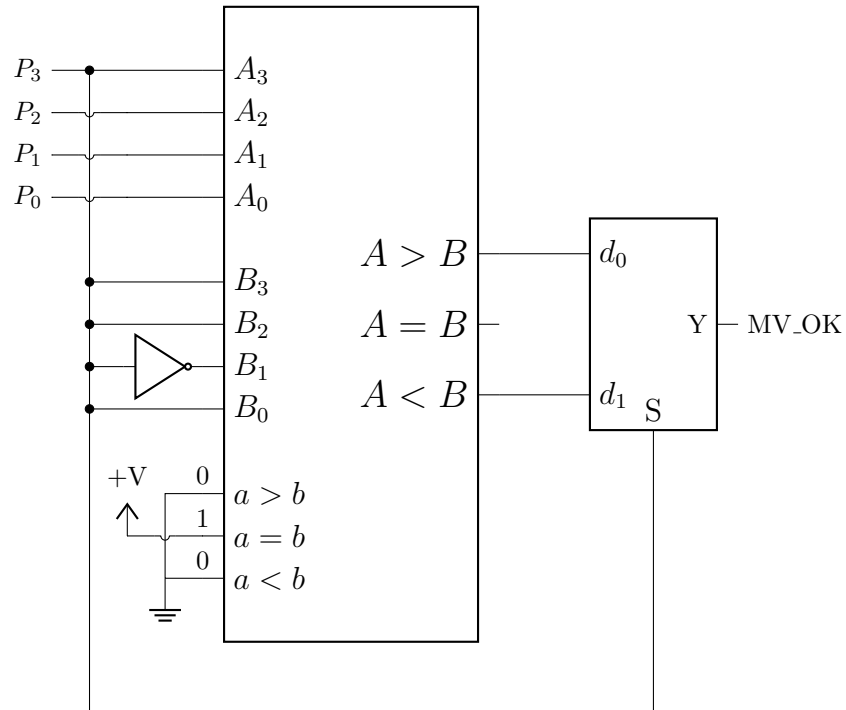
3.a Design a magnitude comparator to compare two 4-bit two's complement numbers, **X** and **Y**.

X_3 A_3
X_2 A_2
X_1 A_1
X_0 A_0

Y_3 B_3
Y_2 B_2
Y_1 B_1
Y_0 B_0

$A > B \dashv X > Y$
$A = B \dashv X = Y$
$A < B \dashv X < Y$

+V   0 $a > b$
  1   $a = b$
  0   $a < b$

3.b Complete the following chartgiving the outputs for the corresponding inputs (the leftmost X and Y bits are the MSBs). Indicate whether the output is correct (i.e. "OK") and give the true relationship of thesignedinputs.

X (in) signed				Y (in) signed				A unsigned				B unsigned				$X > Y$	$X = Y$	$X < Y$	OK (Signed Result)
1	1	0	0	0	1	0	1	0	1	0	0	1	1	0	1	0	0	1	OK ($-4 < +5$)
1	0	1	0	1	0	0	1	1	0	1	0	1	0	0	1	1	0	0	OK ($-6 > -7$)
1	0	0	0	0	1	0	1	0	0	0	0	1	1	0	1	0	0	1	OK ($-8 < +5$)
1	1	0	1	1	1	0	1	1	1	0	1	1	1	0	1	0	1	0	OK ($-3 = -3$)
0	0	1	1	1	1	0	1	1	0	1	1	0	1	0	1	1	0	0	OK ($+3 > -5$)
1	1	0	1	1	1	0	0	1	1	0	1	1	1	0	0	1	0	0	OK ($-3 > -4$)
0	1	1	1	0	1	0	1	0	1	1	1	0	1	0	1	1	0	0	OK ($+7 > +5$)
0	0	1	1	0	1	0	0	0	1	0	0	1	1	0	1	0	0	1	OK ($+3 < +4$)

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