

ECE 2300  
Digital Logic Design

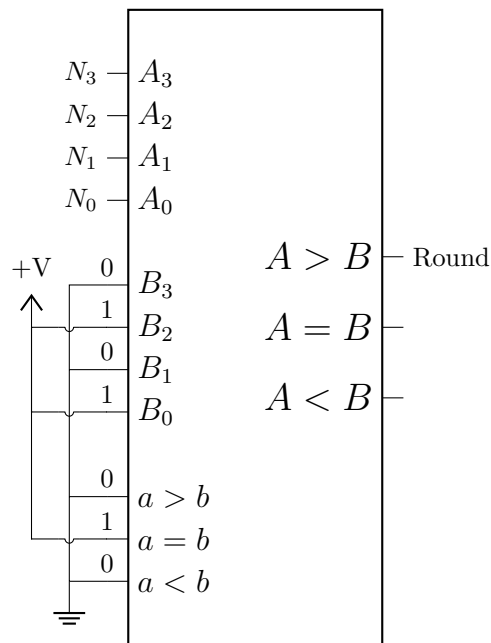
Homework 6

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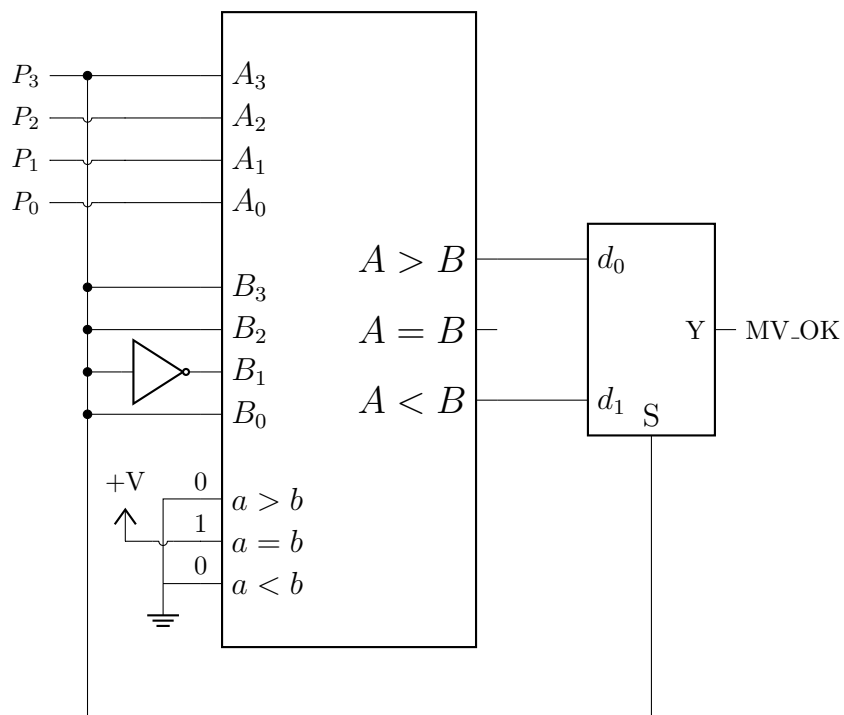
- Using a magnitude comparator, generate a logic one “Round” signal (to round a number up by one) if the base 12 input,  $N = N_3, N_2, N_1, N_0$ , is six or higher. Let N connect to the comparator’s A input.

$$\text{Round} = N > 5 = (N_3 N_2 N_1 N_0)_2 > (0101)_2$$

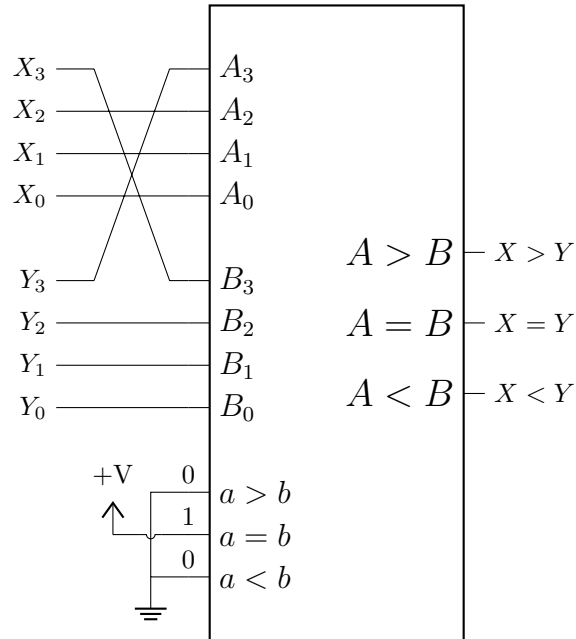


- 2** A simple mechanism moves between positions  $P = (0000)_2$  and  $P = (1111)_2$ . Using a magnitude comparator, generate an enable signal, MV\_OK, that is one if the position, P, is 12 or lower or if it is three or higher.

$P_3$	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.



- 3.b Complete the following chart giving 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 the signed inputs.

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)

- 4 Using magnitude comparators, create a circuit to compare two 8-bit unsigned numbers, X and Y. Let X connect to the comparator A inputs.

