

CSE260 Lab Report

Experiment Name: Implementation of 4-bit Magnitude Comparator.

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Experiment #6

Implement of 4-bit Magnitude Comparator.

Objective:

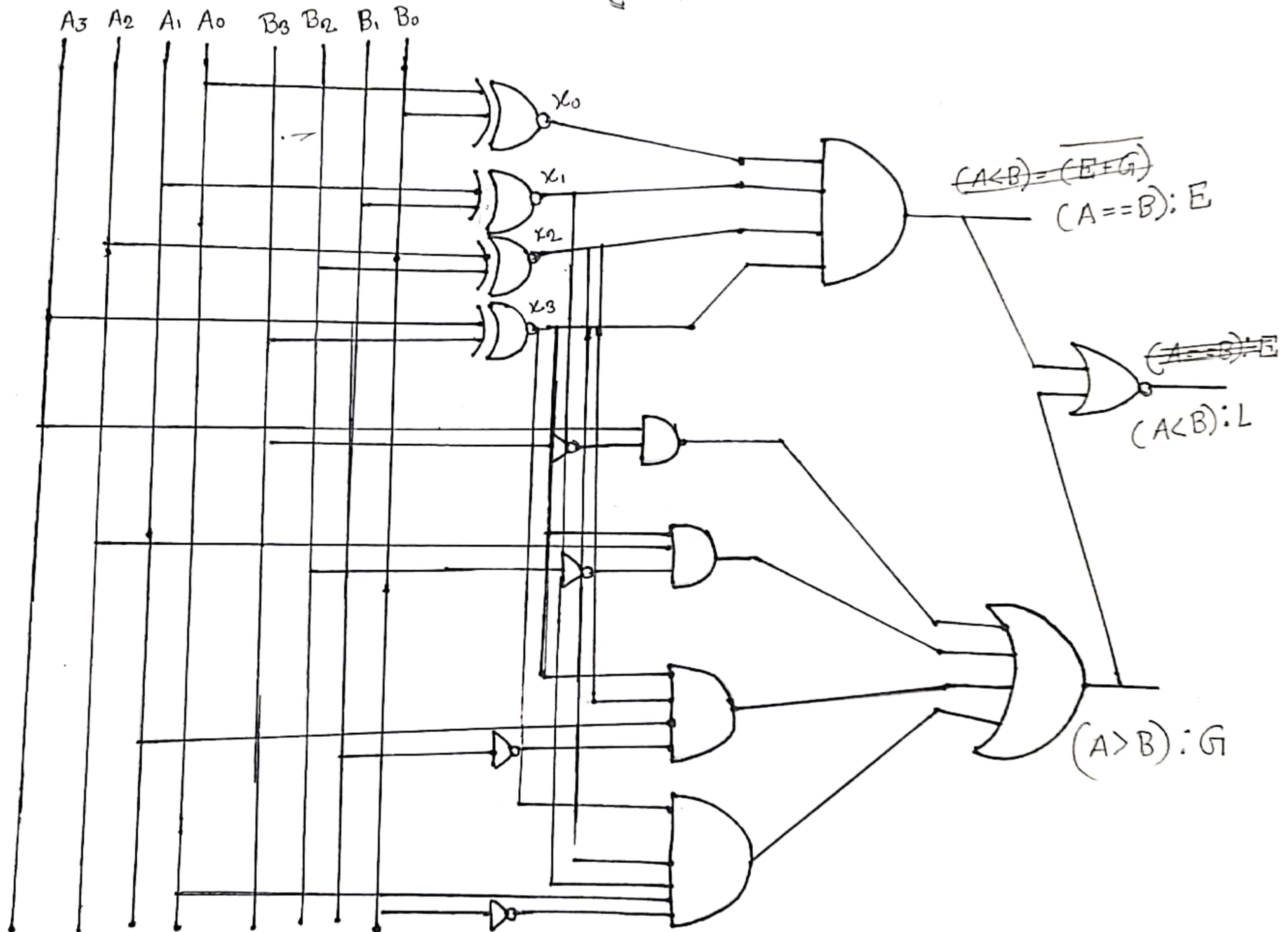
- To implement a 4 bit magnitude Comparator.
- To observe how 4bit magnitude Comparator works.

Required Components and Equipments:

- Logic probe.
- Logic state.
- AND Gate.
- NOR Gate.
- NOT Gate.
- X-OR Gate.
- X-NOR Gate.
- ~~AND~~ Gate OR Gate.

Experimental Setup:

$$(A < B) = (\overline{E} + G)$$



Result and Discussion-

i) $A=B$: (I);

$$A_0=B_0 \text{ and } A_1=B_1 \text{ and } A_2=B_2 \text{ and } A_3=B_3$$

$$A=B (\overline{A_3 B_3 + \bar{A}_3 \bar{B}_3}) \cdot (\overline{A_2 B_2 + \bar{A}_2 \bar{B}_2}) \cdot (\overline{A_1 B_1 + \bar{A}_1 \bar{B}_1}) \cdot (\overline{A_0 B_0 + \bar{A}_0 \bar{B}_0})$$

$$\therefore A=B = X_3 \cdot X_2 \cdot X_1 \cdot X_0$$

ii) $A>B$: (J);

$$A_3=1 \text{ and } B_3=0, A_3 \cdot \bar{B}_3 \text{ or } (A_3=B_3) \text{ and } (A_2=1 \text{ and } B_2=0):$$

$$X_3 A_2 \bar{B}_2 \text{ OR } (A_3=B_3) \text{ and } (A_2=B_2) \text{ and } (A_1=1 \text{ and } B_1=0):$$

$$X_3 \cdot X_2 A_1 \bar{B}_1 \text{ OR } (A_3=B_3) \text{ and } (A_2=B_2) \text{ and } (A_1=B_1) \text{ and}$$

$$(A_0=1 \text{ and } B_0=0) X_3 \cdot X_2 \cdot X_1 \cdot A_0 \bar{B}_0$$

$$\therefore A>B = A_3 \bar{B}_3 + X_3 A_2 \bar{B}_2 + X_3 X_2 A_1 \bar{B}_1 + X_3 X_2 X_1 A_0 \bar{B}_0$$

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iii) $A < B: (K)$

$A_3 = 0$ and $B_3 = 1, \bar{A}_3 B_3$ OR $(A_3 = B_3)$ and $(A_2 = 0$ and $B_2 = 1):$

$\chi_3 \cdot \bar{\chi}_2 \bar{A}_2 B_2$ OR $(A_3 = B_3)$ and $(A_2 = B_2)$ and $(A_1 = 0$ and $B_1 = 1): \chi_3$

$\chi_2 \cdot \bar{A}_1 B_1$ OR $(A_3 = B_3)$ and $(A_2 = B_2)$ and $(A_1 = B_1)$ and $(A_0 = 0$ and $B_0 = 1):$

$\chi_3 \chi_2 \chi_1 \bar{A}_0 B_0$

The changes we need to make:

$$A = B (I) = \chi_0 \chi_1 \chi_2 \chi_3$$

$$A > B: (J) = A_3 \bar{B}_3 + \chi_3 A_2 \bar{B}_2 + \chi_3 \chi_2 A_1 \bar{B}_1 + \chi_3 \chi_2 \chi_1 A_0 \bar{B}_0$$

$$A < B: (K) = \bar{A}_3 B_3 + \chi_3 \bar{A}_2 B_2 + \chi_3 \chi_2 A_1 \bar{B}_1 + \chi_3 \chi_2 \chi_1 \bar{A}_0 B_0$$

For $(A < B)$

$(A < B)$ if A is not equal to B and A is not greater than B .

$$\therefore (A < B) = \bar{I} \cdot \bar{J}$$

$$\Rightarrow K = \overline{(I + J)}$$

Implement using NOR gate the following table:

$A > B$	$A == B$	$A < B$
0	0	1
0	1	0
1	0	0
1	1	Undefined