Magnitude Comparator :-

The magnitude comparator is a combinational circuit that compares two no's A and B and determines their relative magnitudes. The outcome of the comparison is specified by 3 binary variable that indicate whether $A > B$, $A = B$ or $A < B$.

1) Equality -

xnor (equivalence)

$$x_i = A_i B_i + A_i' B_i'$$

where $i = 0, 1, 2, \ldots$

where $x_i = 1$ only if the pair of bits in position i are equal i.e:- both are 1s or both are 0s.

Eg:- $A = A_3 A_2 A_1 A_0$ $\quad x_0, x_1, x_2, x_3$

$B = B_3 B_2 B_1 B_0$

$Z = \text{AND}(x_0, x_1, x_2, x_3)$

if $Z = 1$ then $A = B$

if $Z = 0$ then $A \neq B$

For the equality condition to exist all x_i variables must be equal to 1. This indicates 'AND' operation of all variables.

$$(A = B) = (x_0 \cdot x_1 \cdot x_2 \cdot x_3) = 1$$

2) Greater than or less than -

$(A > B)$

$A = A_3 A_2 A_1$

$B = B_3 B_2 B_1$

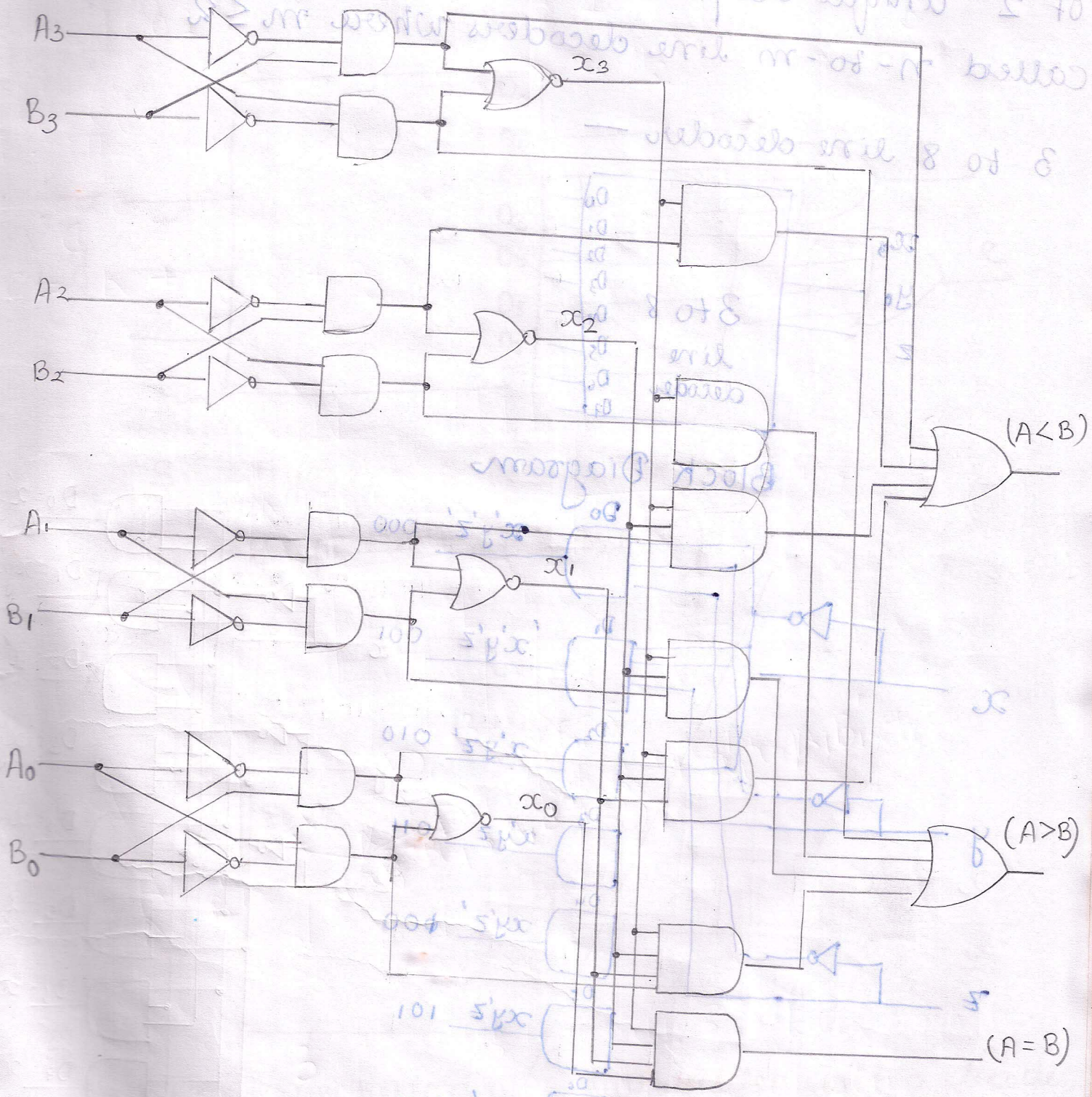
if $x_3 \cdot x_2 \cdot x_1 \cdot$

$x_3 \cdot x_2 \cdot x_1 =$

$x_4 \cdot x_0$

$$(A>B) = A_3 B_3' + x_3 A_2 B_2' + x_3 x_2 A_1 B_1' + x_3 x_2 x_1 A_0 B_0'$$

$$(A<B) = A_3' B_3 + x_3 A_2' B_2 + x_3 x_2 A_1' B_1 + x_3 x_2 x_1 A_0' B_0$$



4-bit magnitude comparator