LAB REPORT

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Computer Science and Engineering

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Section	:	B
Semester	:	2nd Semester
Experiment No	:	06

Experiment Name : Comparators

AIM :

To realize one and four bit comparator

Learning Objective :

(i) To Learn abaut variaes applications of comparators.
(ii) To realize comparators with basic and exclusive gates.

Theory :

Magnitude comparators is a logical circuit, which compares two signals A and B and generates three logical outputs whether A > B, A = B or A < B.

Components Required:

IC 7408, IC 7411, IC 7421, IC 7486, IC 7404, patch cords and IC Trainer kit.

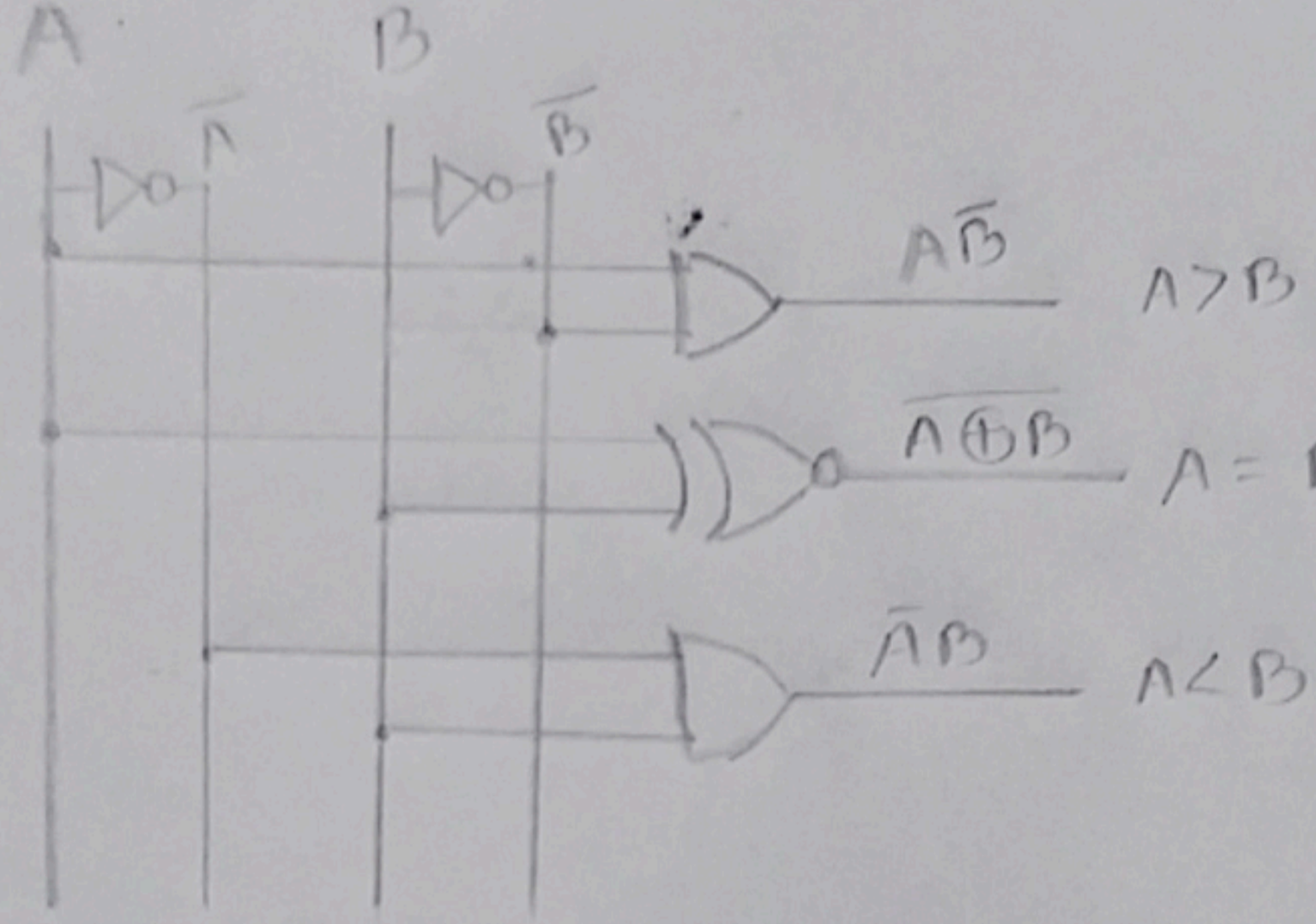
1-bit comparator :

A	B	A>B	A=B	A<B
0	0	0	1	0
0	1	0	0	1
1	0	1	0	0
1	1	0	1	0

$(A > B) = A\bar{B}$

$(A = B) = \overline{A \oplus B}$

$(A < B) = \bar{A}B$



4 Bit Comparators :

Here, inputs are A (A_3 A_2 A_1 A_0) & B(B_3 B_2 B_1 B_0)

$A = B$; if

$A_3 = B_3$ and $A_2 = B_2$ and $A_1 = B_1$ and $A_0 = B_0$

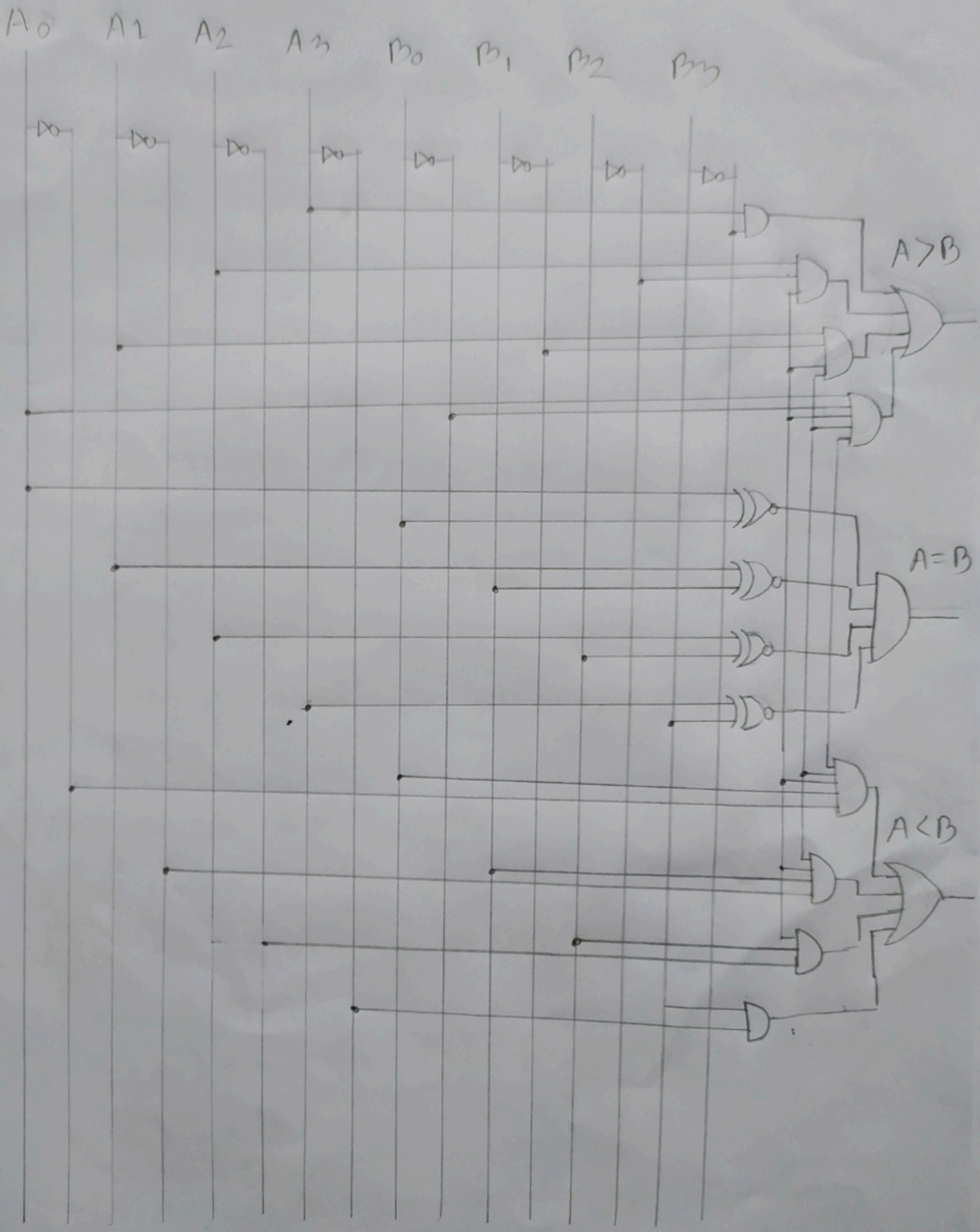
$= (\overline{A_3 \oplus B_3}) \cdot (\overline{A_2 \oplus B_2}) \cdot (\overline{A_1 \oplus B_1}) \cdot (\overline{A_0 \oplus B_0})$

$= x_3 \cdot x_2 \cdot x_1 \cdot x_0$

Similarly,

$A > B = A_3\bar{B_3} + x_3 A_2 \bar{B_2} + x_3 x_2 A_1 \bar{B_1} + x_3 x_2 x_1 A_0 \bar{B_0}$

$A < B = \bar{A_3} B_3 + x_3 \bar{A_2} B_2 + x_3 x_2 \bar{A_1} B_1 + x_3 x_2 x_1 \bar{A_0} B_0$


A0
A1
A2
A3
B0
B1
B2
B3
A>B
A=B
A<B

Viba Question:

1. What is comparator?

Ans: An electronic circuit that compares two inputs and outputs in 3 results. ie, greater than, equal to and less than is called comparator.

2. What are the applications of Comparators?

Ans: A magnitude comparator is a hardware electronic device that takes two numbers as input in binary form and determines whether one number is greater than or less than or equal to the other number comparators are also used in CPU and MCUs.

3. Design a 2 Bit Comparator using a single logic gates.

Ans: Here, inputs are $A(A_1, A_0)$ and $B(B_1, B_0)$

For $A = B$,

$(A_1 = B_1)$ and $(A_0 = B_0) = \overline{(A_1 \oplus B_1)} \cdot \overline{(A_0 \oplus B_0)}$

$= \overline{x_1 x_0} = \overline{(A_1 B_1 + \bar{A}_1 \bar{B}_1) \cdot (A_0 B_0 + \bar{A}_0 \bar{B}_0)}$

$= \overline{(A_1 B_1 \cdot \bar{A}_1 \bar{B}_1)} \cdot \overline{(A_0 B_0 \quad \bar{A}_0 \bar{B}_0)}$

Similarly,

for $A > B = A_1\overline{B_1} + x_1 A_0 \overline{B_0} = \overline{\overline{A_1\overline{B_1}} \cdot \overline{x_1 A_0 \overline{B_0}}}$

for $A < B = \overline{A_1} B_1 + x_1 \overline{A_0} B_0 = \overline{\overline{\overline{A_1} B_1} \cdot \overline{x_1 \overline{A_0} B_0}}$