Course Name:	**Digital Design Laboratory**	**Semester:**	**III**
Date of Performance:	**__21_ / 08 /_23____**	**Batch No:**	**B-2**
Faculty Name:		**Roll No:**	**16010122151**
Faculty Sign & Date:		**Grade/Marks:**	**___/25**

Experiment No: 4

Title: 4-bit magnitude comparator

Aim and Objective of the Experiment:

To design and implement 1-bit comparator using logic gates and verify 4-bit magnitude comparator using IC 7485

COs to be achieved:

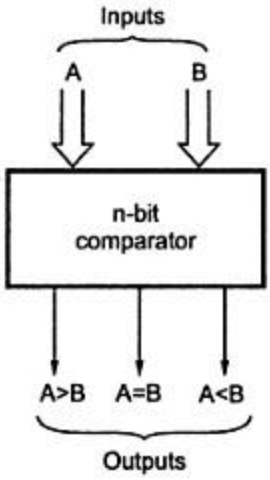
CO2: Use different minimization techniques and solve combinational circuits.

Tools used:

Trainer kits

Theory:

Comparator: The comparison of two numbers is an operator that determines one number is greater than, less than (or) equal to the other number. A magnitude comparator is a combinational circuit that compares two numbers A and B and determines their relative magnitude. The outcome of the comparator is specified by three binary variables that indicate whether A>B, A=B (or) A<B.



1-bit Comparator Implementation Details:

Truth Table

Input		Output		
A	B	$Y_{A=B}$	$Y_{A>B}$	$Y_{A<B}$
0	0	1	0	0
0	1	0	0	1
1	1	0	1	0
1	1	1	0	0

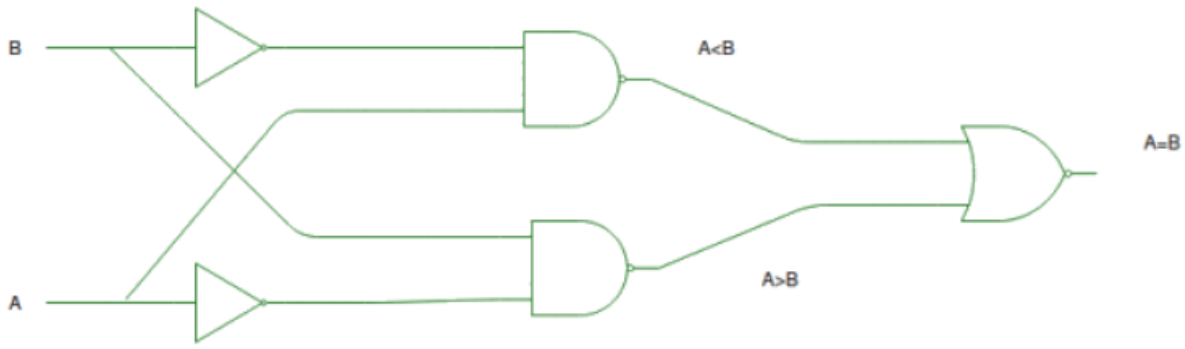
From the Truth Table:

(A<B) = A'B

(A=B) = A'B' + AB

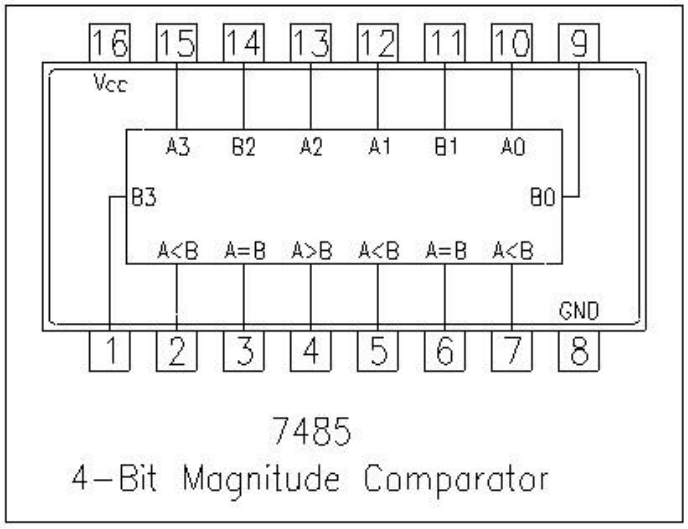
(A>B) = AB'

Logic Diagram of 1-bit Comparator

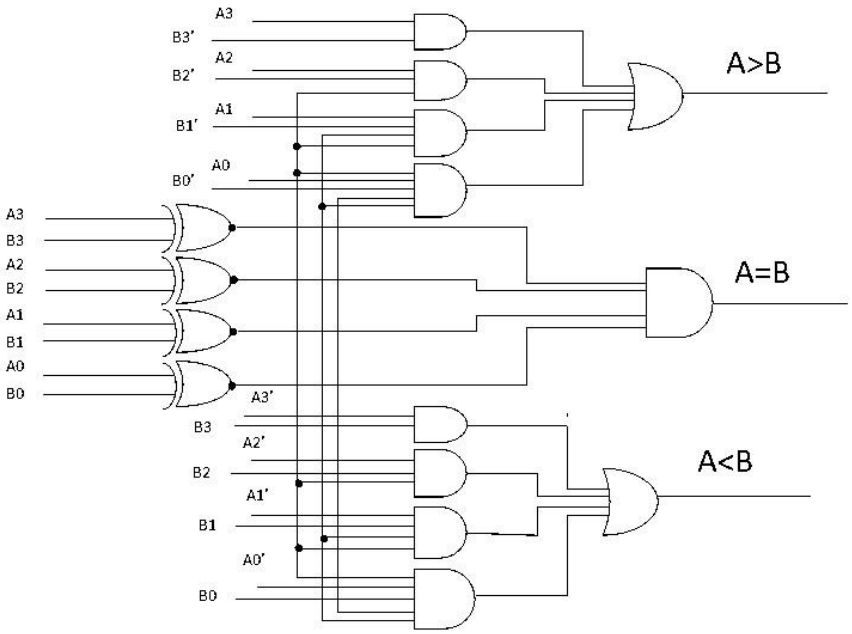


Four Bit Magnitude Comparator Implementation Details

Pin Diagram of IC 7485



Logic Diagram of IC 7485



Comparing Table

INPUTS of 4 bit Comparator				OUTPUT		
A3, B3	*A2, B2*	*A3, B3*	*A2, B2*	*A3, B3*	*A2, B2*	*A3, B3*
A3 > B3	X	X	X	H	L	L
A3 < B3	X	X	X	L	H	L
A3 = B3	A2 > B2	X	X	H	L	L
A3 = B3	A2 < B2	X	X	L	H	L
A3 = B3	A2 = B2	A1 > B1	X	H	L	L
A3 = B3	A2 = B2	A1 < B1	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 >B0	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 < B0	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	H

Where H = High Output, L = Low Output, X = Don't Care

Implementation Details

Procedure:

1) Locate the IC 7485 on the trainer kit.
2) Connect 1st input no. to A3-A0 input slot and 2nd to B3-B0.
3) Connect the output $Y_{A>B}$, $Y_{A<B}$ and $Y_{A=B}$ to the output indicators.
4) Switch ON the power supply and monitor the output for various input combinations.

Post Lab Subjective/Objective type Questions:

1. Design 2-bit magnitude comparator.

A1	A0	B1	B0	A > B	A = B	A < B
0	0	0	0	0	1	0
0	0	0	1	1	0	0
0	0	1	0	1	0	0
0	0	1	1	1	0	0
0	1	0	0	0	0	1
0	1	0	1	0	1	0
0	1	1	0	1	0	0
0	1	1	1	1	0	0
1	0	0	0	0	0	1
1	0	0	1	0	0	1
1	0	1	0	0	1	0
1	0	1	1	1	0	0
1	1	0	0	0	0	1
1	1	0	1	0	0	1
1	1	1	0	0	0	1
1	1	1	1	0	1	0

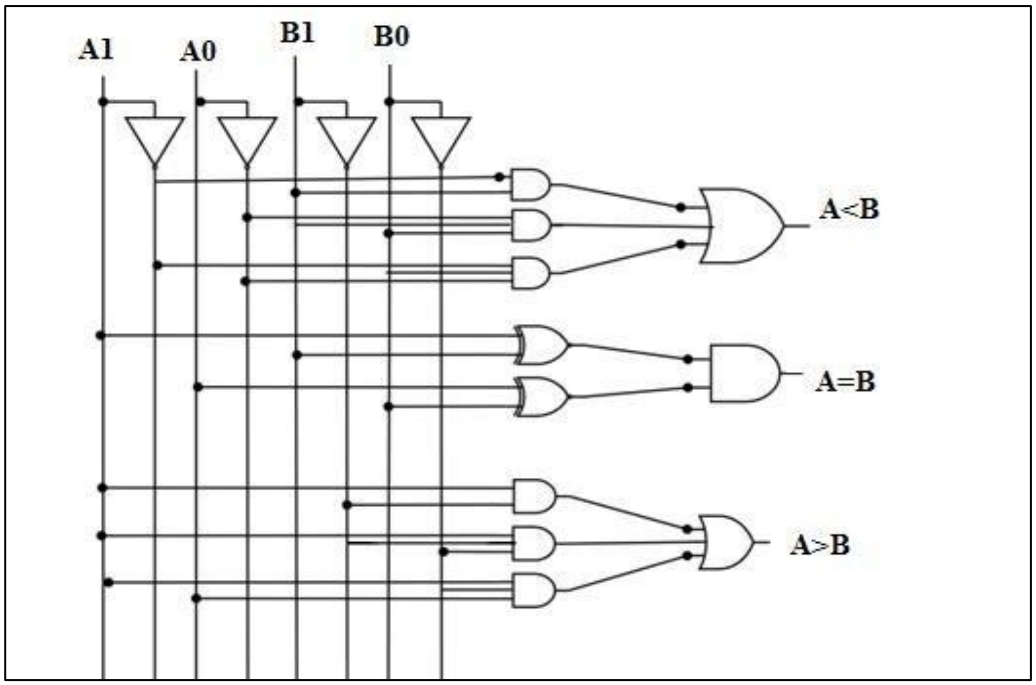
From the Truth Table:

(A<B) = $A_1'B_1 + A_0'B_1B_0 + A_1'A0'B0$

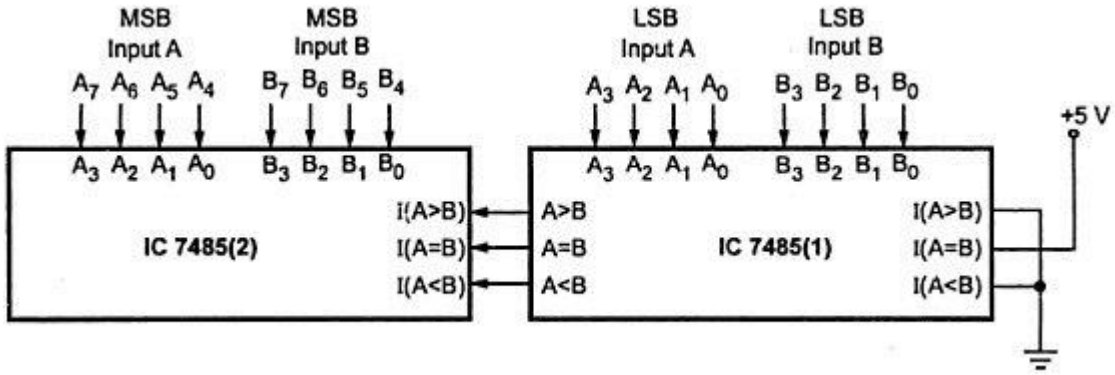
(A=B) = $A_1'A_0'B_1'B_0' + A_1'A_0B_1'B_0 + A_1A_0B_1B_0 + A_1A_0'B_1B_0'$

(A>B) = $A_1B_1' + A_0B_1'B_0' + A_1A_0B_0'$

Logic Diagram:



2. How can we implement 5-bit magnitude comparator using IC 7485.



Conclusion:
From this experiment we learnt the concept of comparators .

Signature of faculty in-charge with Date: