CSE260 Lab Report-6

Experiment: Implementation of 4-bit Magnitude Comparator

Group-1:

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1) Name of the Experiment: Implementation of 4-bit Magnitude Comparator.

2) Objective:

- ☐ Draw the circuit that will act as a Magnitude Comparator. Your circuit should be able to compare two 4 bits number.
- ☐ Implement your circuit (for two 4-bit numbers)

3) Required Components and Equipments: Bread Board, Trainer Board, IC-7408 (AND gate), IC-7432 (OR gate and IC-7404 (NOT gate), wires.

4) Experimental Setup: In this experiment a magnitude comparator has been made for 2-bit numbers taking input A and B and taking the circuit for $A=B$, $A>B$ and $A<B$. Firstly, all the wires and gates used in the experiment were checked. Now, for 2-bits a circuit diagram was drawn for $A=B$. Consequently, 4 inputs were taken which were A_1, B_1, A_0 and B_0. Red wires were used for A_1 and A_0 and blue wires were used for B_1 and B_0. The IC-7408, IC-7432 and IC-7404 were

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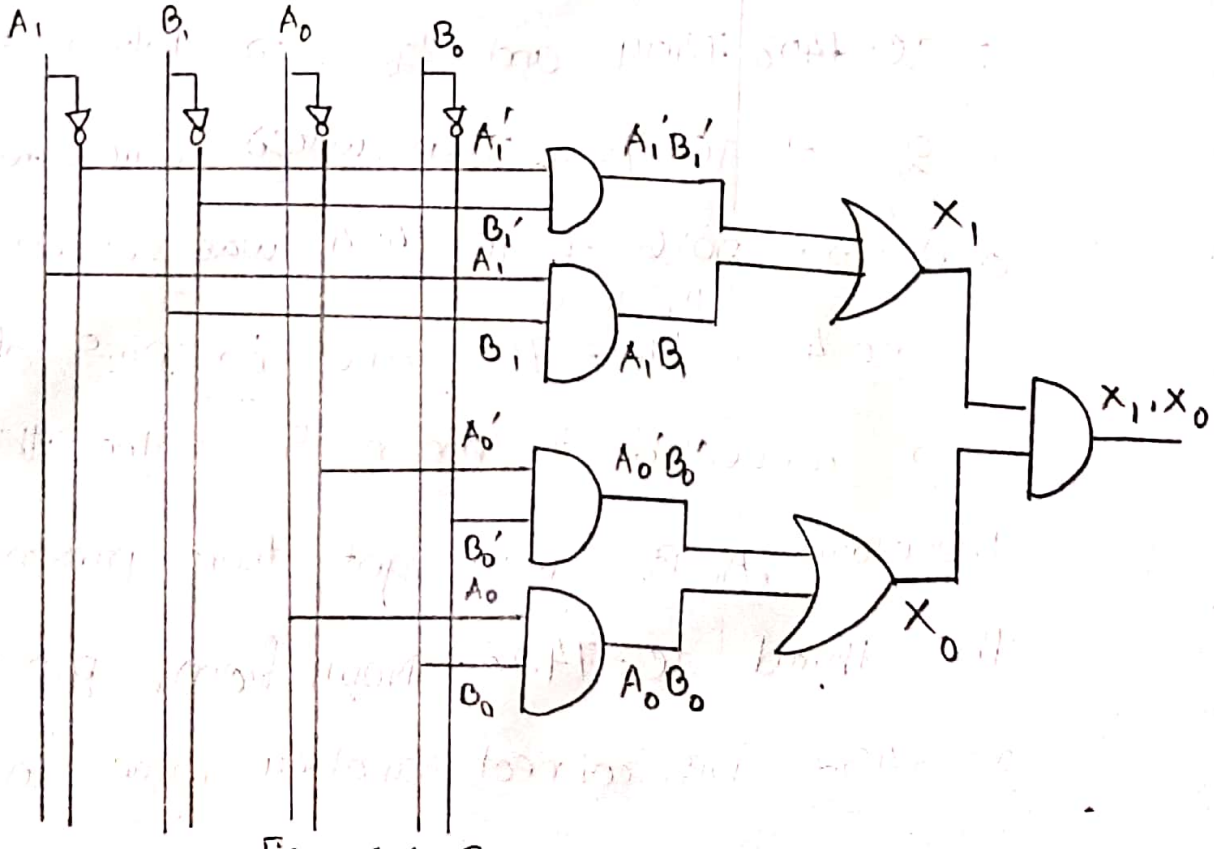
connected to GND and "5V" taking wires from pin no.7 and pin no-14. To start with, A_1' was got from pin no.2 of IC-7404 taking input A_1 from pin no.1 of IC-7404. Similarly, B_1' was found taking input from B_1 and connecting it to IC-7404 of IC-7404 and taking B_1' from pin no.4. Similarly from pin no-6 we take A_0' taking A_0 as input from pin no.5 and also B_0' was got from pin no.8 taking B_0 as input from pin no.9. Then, we take A_1' from pin no.2 of IC-7404 and connect it to pin no.1 of IC-7408 and take B_1' from pin no.4 of IC-7404 and connect it to pin no.3 of ~~IC-7432~~ IC-7408. As a result, we get $A_1'B_1'$. In the same way, A_1 and B_1 were taken from IC-7404 from pin no.1 and pin no.2 respectively and connected to pin no.4 and pin no.5 of IC-7408. Hence, we get $A_1'B_1'$ from pin no.3 of IC-7408 and A_1B_1 from ~~IC-~~ pin no.6 of IC-7408. Then, a wire was used from pin no.3 of IC-7408 and connected to pin no.1 of IC-7432. Similarly, another wire was taken from IC-7408 which was from pin no.6

and connected to pin no.2 of IC-7432. Hence, from pin no.3 of IC-7432 $(A_1'B_1' + A_1B_1)$ is got. Then, A_0' is taken from IC-7404 from IC pin no. 6 and B_0' is taken from IC-7404 from pin no.8. From pin no.6 of IC-7404 and pin no.8 of IC-7404 A_0' and B_0' are taken as input connecting pin no.6 of IC-7404 to pin no.10 of IC-7408 and also connecting pin no.8 of IC-7404 to pin no.9 of IC-7408. As a result, $A_0'B_0'$ is got from pin no.8 of IC-7408. Similarly, A_0 and B_0 are taken as input from pin no.5 of IC-7404 and pin no.9 of IC-7404 and connected to pin no.13 and pin no.12 of IC-7408. Hence, A_0B_0 ~~$(A_0'B_0' + A_0B_0)$~~ is got from pin no.11 of IC-7408. Then pin no.8 of IC-7408 was connected to pin no.4 of IC-7432 and pin no.11 of IC-7408 was connected to pin no.5 of IC-7432. Therefore, $A_0'B_0' + A_0B_0$ was got from pin no.6 of IC-7432. After that, another IC-7408 was taken. Then, taking wires from pin no.3 and pin no.6 of IC-7432 a connection was made to pin no.1 and pin no.2

of the ~~m~~ new IC-7408. Two, for A=B output was got from the new IC-7408 from pin no.3 ~~of~~ IC and connected. After that, outputs were matched with the truth table. Now, for A>B, $X_1 = (A_1'B_1' + A_1B_1)$ was taken. Then, another wire was taken from pin no.1 of IC-7404 which was A_1 and also a wire was taken from pin no. 4 of IC-7404 which was B_1'. Pin no.1 and pin no.4 of IC-7404 were connected to pin no.4 and pin no.5 of the new IC-7408. Here, A_1B_1' was got from pin no.6 of the new IC-7408. After that A_0 and B_0' were taken from pin no.5 and pin no.8 of IC-7404 and connected to pin no.10 and pin no.9 of the new IC-7408. So, A_0B_0' was got from pin no.8 of the new IC-7408. Now, pin no.3 and pin no.8 of ~~IC~~ the new IC-7408 were connected to pin no.13 and pin no.12 of the new IC-7408. Hence, $X_1.(A_0B_0')$ was got from pin no.11 of the new IC-7408. Then, we another IC-7408 was taken. After that pin no.6 of the new IC-7408 and pin no.11

of the new-IC - 7408 were connected to pin no. 10 and pin no. 9 of IC-7432. As a result, A > B was got from pin no. 8 of IC-7432 and connected to the output and matched with the truth table of A > B. Now, a circuit was made for A < B. To start with, for this circuit, the third IC-7408 which was taken was used. A_1' was again taken from pin no. 2 of IC-7404 and B_1 from pin no. 3 of IC-7404 and connected to pin no. 1 and pin no. 2 of the recently added third IC-7408. So, $A_1'B_1$ was got from pin no. 3 of the third IC-7408. Then A_0' was taken from pin no. 6 of IC-7408 7404 and B_0 was taken from pin no. 9 of IC-7404. Then, wires were used and pin no. 6 of IC-7404 was connected to pin no. 4 of the third IC-7408 and pin no. 9 of IC-7404 was connected to pin no. 5 of the third IC-7408. Therefore, $A_0'B_0$ was got from pin no. 6 of the third IC-7408. Now, from pin no. 3 of IC-7432 we connect another wire to pin no. 10

of the ~~new thind~~ IC-7432 and $A_0'B_0$ taken from the thind IC-7408 from pin no.6 was connected to pin no.9 of the thind IC-7408. Hence, $X_1 \cdot (A_0'B_0)$ was got from pin no.8 of thind IC-7408. Now, $A_1'B_1'$ which was got from pin no.3 of the thind IC-7408 was connected to pin no.13 of IC-7432 and a wire was taken from pin no.8 of the thind IC-7408 and connected to pin no.2 of IC-7432. So, A<B was got from pin no. 11 of IC-7432 and afterwards the outputs were matched with the truth table of A<B.



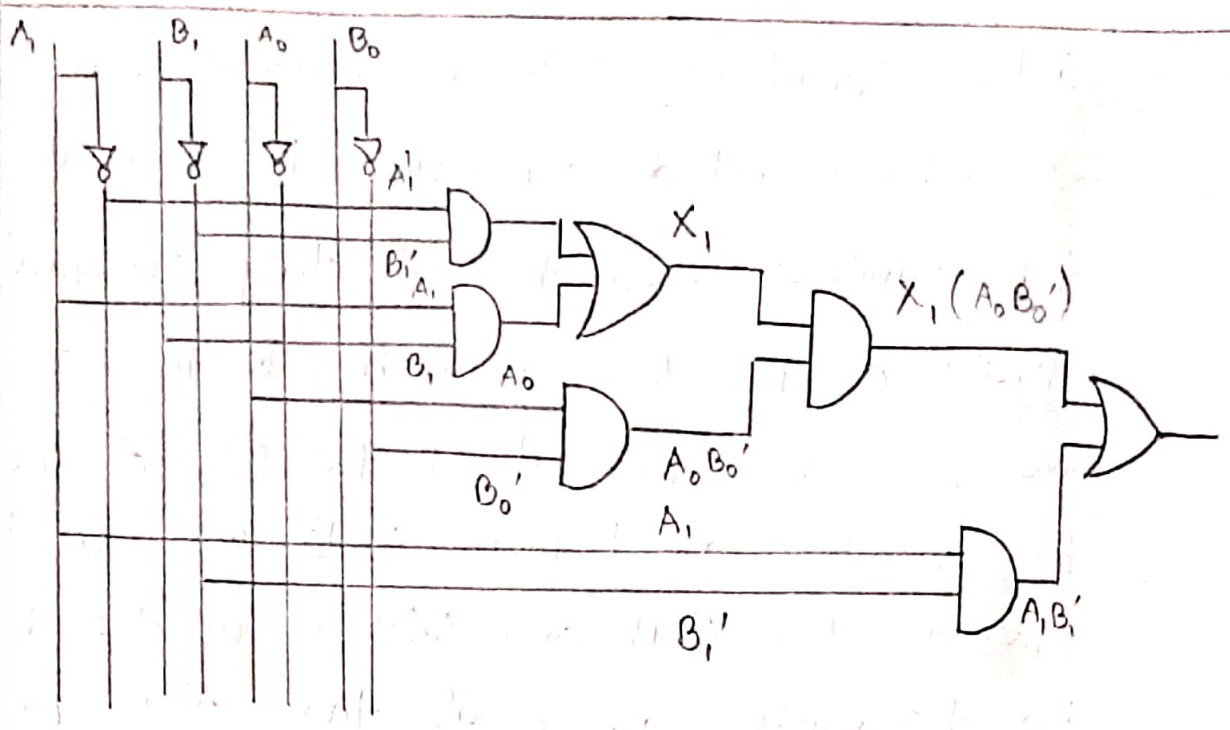


Figure: A > B

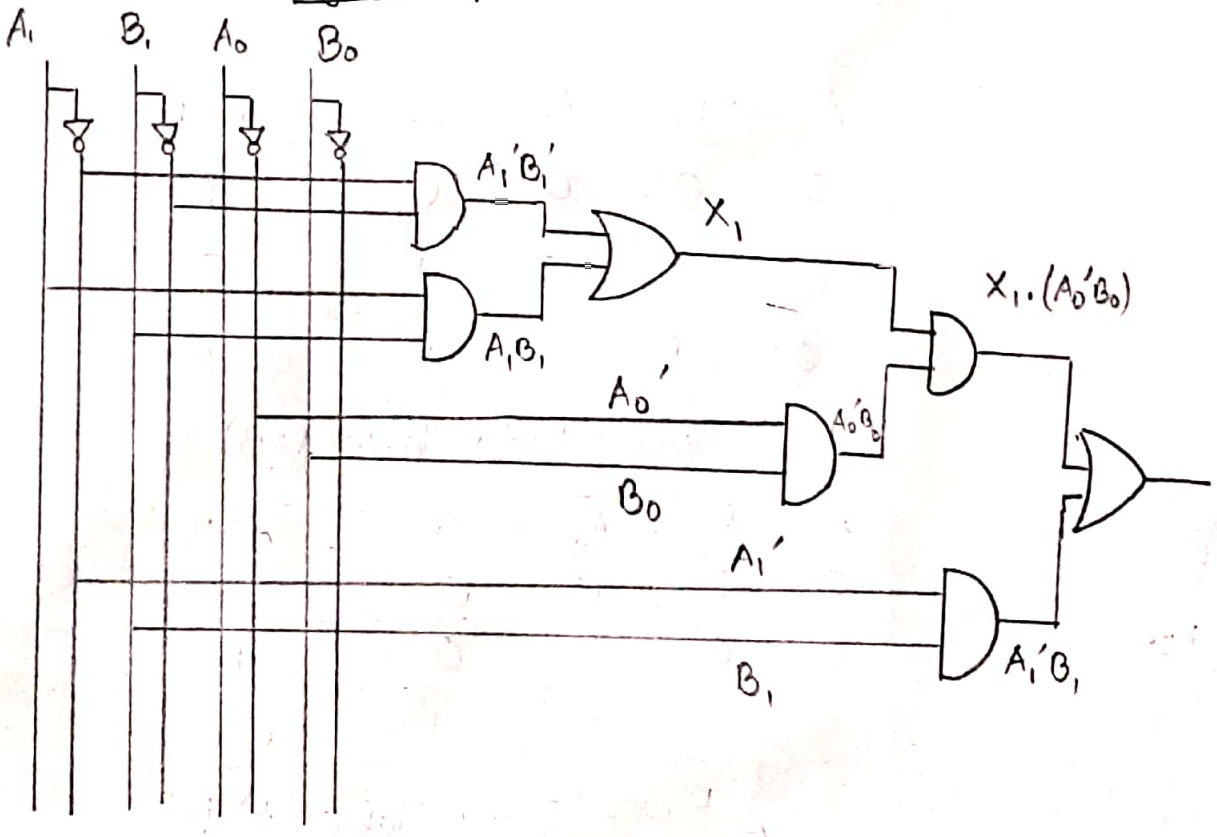


Figure: A < B

5) Results and Discussion: In this experiment, we implemented a 4 bit magnitude comparator to compare 2 4-bit numbers and check if they are equal or greater or less than a number. In this case, we can see that if all the bits of the two numbers are 1 then A=B will be 1 otherwise for A>B and A<B if all the bits of the two numbers are equal then A>B and A<B will be 0.

A_1	B_1	A_0	B_0	A = B
0	0	0	0	1
0	0	0	1	0
1	1	1	1	1

Figure: Truth Table(A=B)

A_1	B_1	A_0	B_0	A>B
0	0	0	0	0
0	0	1	0	1
1	1	1	1	0

Figure: Truth Table (A>B)

A_1	B_1	A_0	B_0	A<B
0	0	0	0	0
0	1	0	0	1
1	1	1	1	0

Figure: Truth Table(A<B)