Lab 7

To Demonstrate the Working of a Digital Comparator

Note: You may draw all the logic diagrams with hand and paste the pictures here or on logicly software with your name, roll number & section mentioned in your workspace. Make sure that all of your connections are clearly visible and distinguishable. In logicly, use "text" label to point out/show all your inputs & outputs

Tasks

1. **Construct a logic circuit for a 2 bit magnitude comparator Also write the Boolean expression for output(s). Simulate your circuit in logicly software.**
   Hint: Take 2 bits of each input i.e. A1A0 & B1B0

2-Bit Magnitude Comparator

a) Truth Table

Q No 1 Part(a) Truth table of 2-bit comparator.

A_1	A_0	B_1	B_0	$A > B$	$A < B$	$A = B$
0	0	0	0	0	0	1
0	0	0	1	0	1	0
0	0	1	0	0	1	0
0	0	1	1	0	1	0
0	1	0	0	1	0	0
0	1	0	1	0	0	1
0	1	1	0	0	1	0
0	1	1	1	0	1	0
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	0	1
1	0	1	1	0	1	0
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	0	0	1

b) Boolean Expression (Simplified)

Q NO 1 Part (b)

Boolean Expression (Simplified)

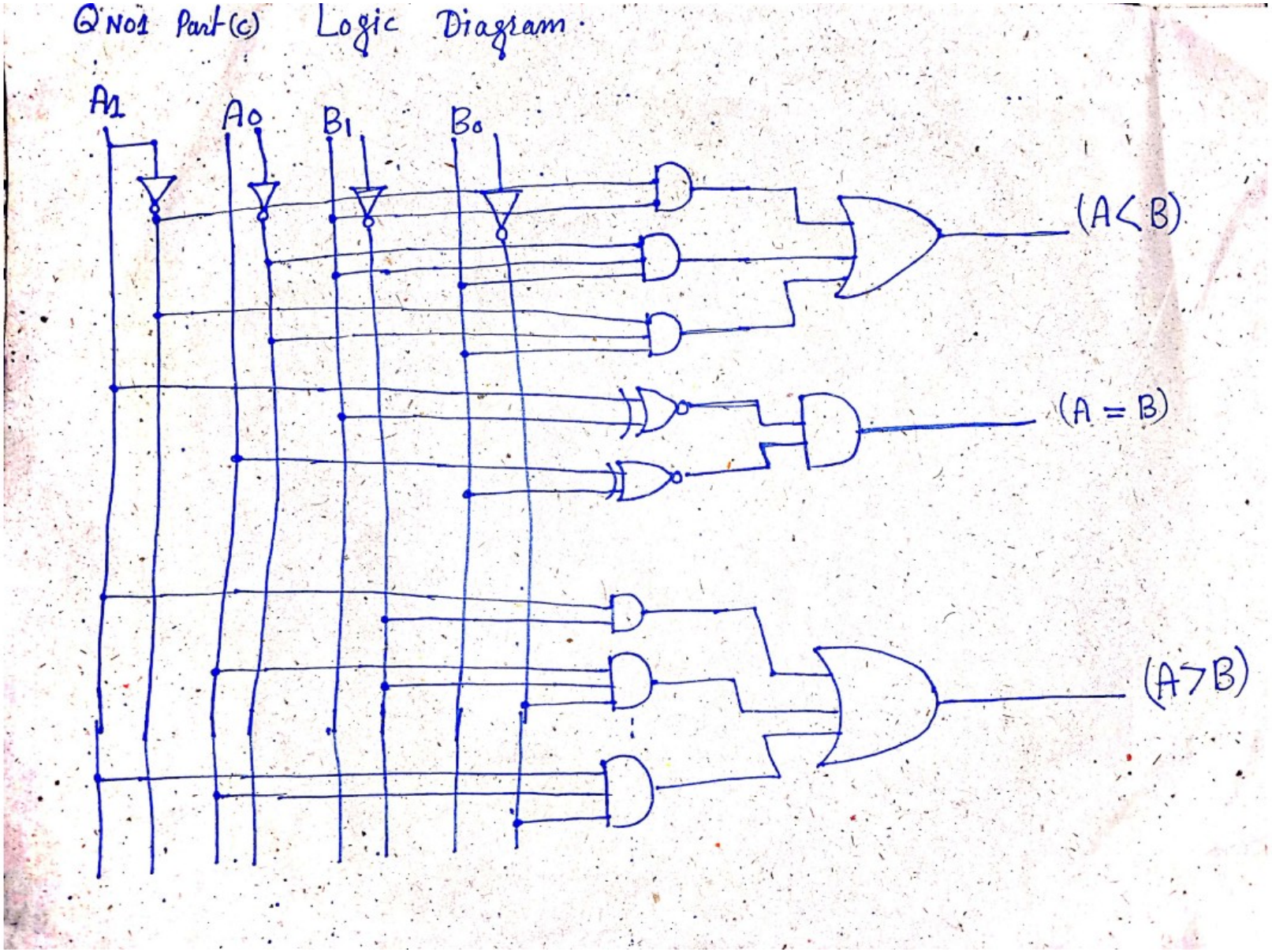
$A > B = A_1 B_1' + B_0' (A_0 B_1' + A_0 A_1')$

$A < B = B_1 A_1' + B_0 B_1 A_0' + A_1' A_0' B_0$

$A = B = \overline{A_0 \oplus B_0} \cdot \overline{A_1 \oplus B_1}$

c) Logic Diagram

Q No1 Part (c) Logic Diagram.



d) Software Simulation (Show here your results for each combination that gives a high output)

2) Construct a logic circuit for a 4-bit magnitude comparator Also write the Boolean expression for output(s). Simulate your circuit in logicaly software.

You may take help from the logic diagram available on the Internet and compare it with yours for better understanding.

The logic circuit should be hand drawn (neatly) with all necessary labels (inputs/outputs).

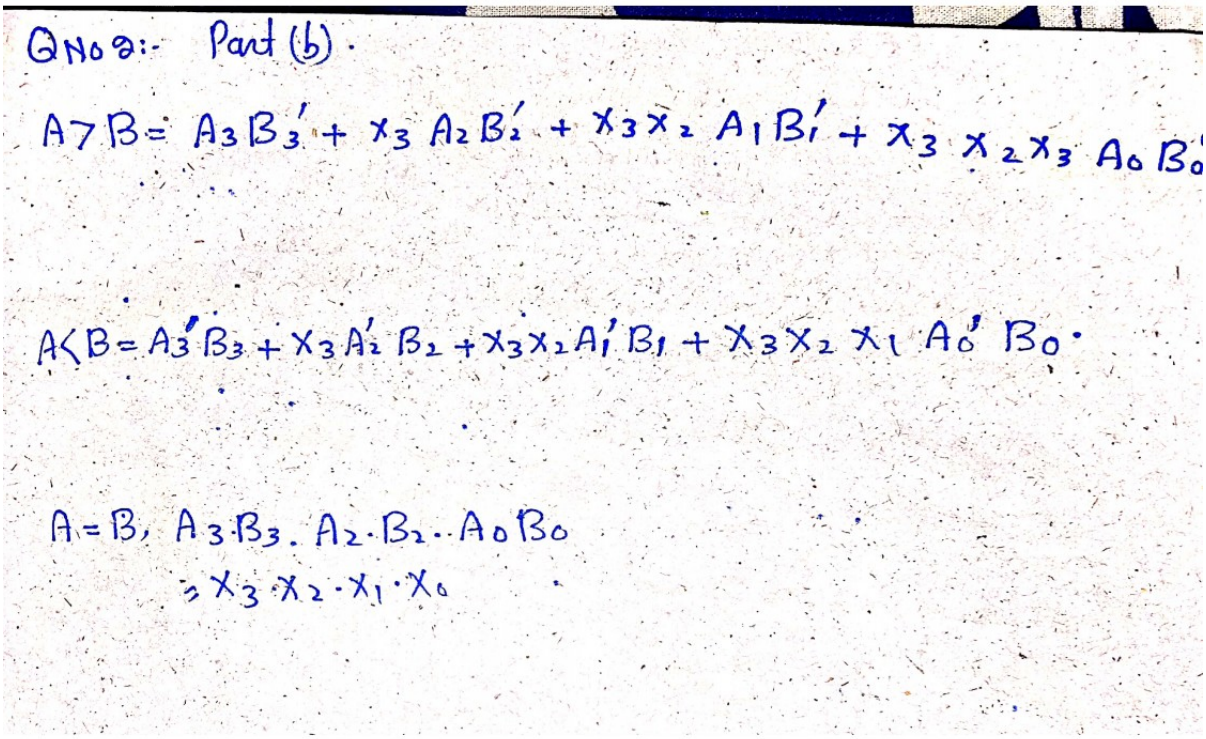
4-Bit Magnitude Comparator

a) Truth Table

QNo2: Part (a) Truth Table.

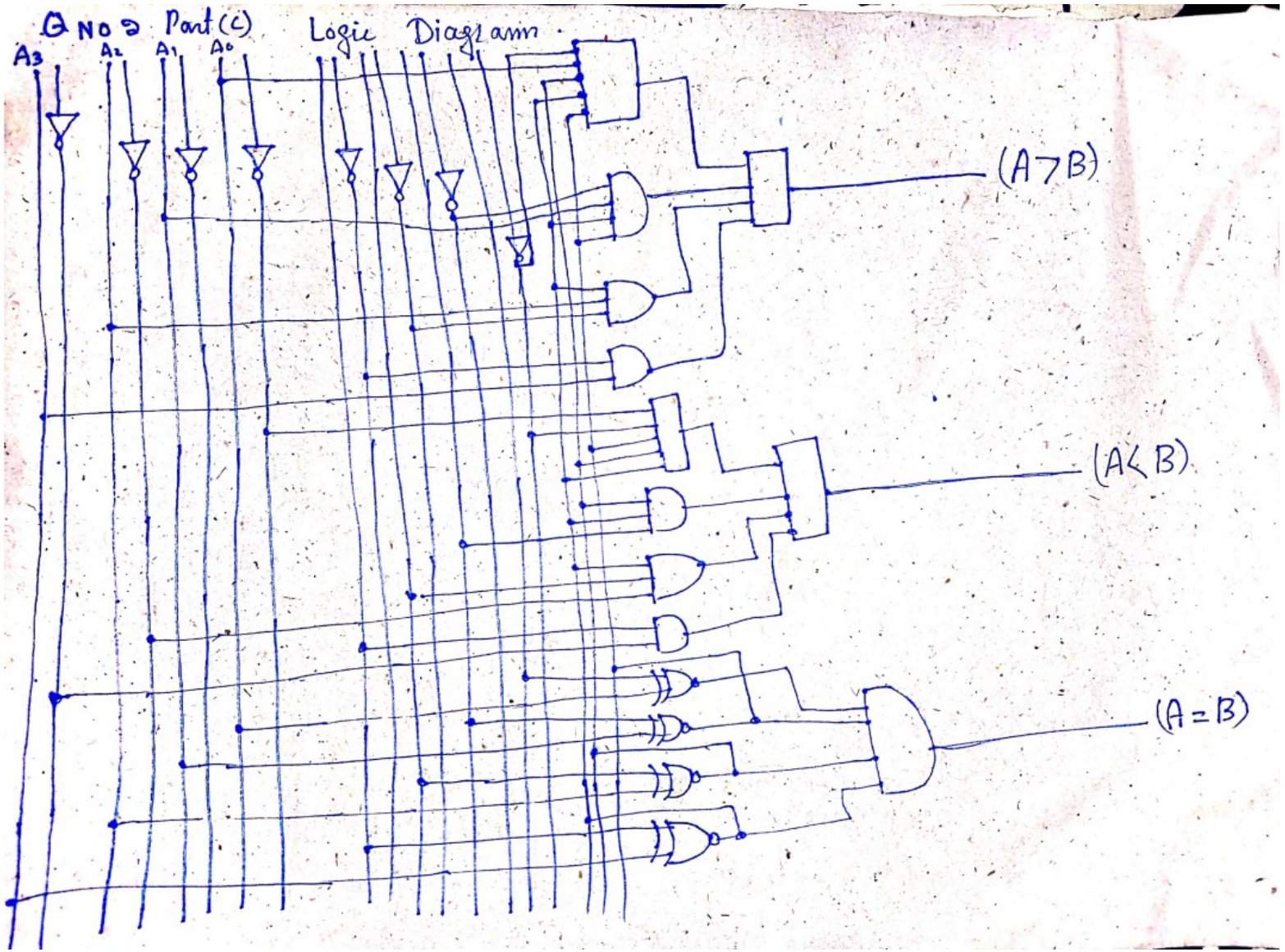
$A_3 B_3$	$A_2 B_2$	$A_1 B_1$	$A_0 B_0$	A>B	A<B	A=B
$A_3 > B_3$	X	X	X	1	0	0
$A_3 < B_3$	X	X	X	0	1	0
$A_3 = B_3$	$A_2 > B_2$	X	X	1	0	0
$A_3 = B_3$	$A_2 < B_2$	X	X	0	1	0
$A_3 = B_3$	$A_2 = B_2$	$A_1 > B_1$	X	1	0	0
$A_3 = B_3$	$A_2 = B_2$	$A_1 < B_1$	X	0	1	0
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 > B_0$	1	0	0
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 < B_0$	0	1	0
$A_3 = B_3$	$A_2 = B_2$	$A_1 = B_1$	$A_0 = B_0$	0	0	1

b) Boolean Expression



c) Logic Diagram

Q No 9 Part (c) Logic Diagram



d) Software Simulation (Show here your results for each combination that gives a high output)