Lab 6
Logic Circuits (EET 241)
Total Points: 100

Objective: Verification of Exclusive-OR(X-NOR) and Exclusive-NOR (X-NOR) logic diagram.

Materials Needed:

7404 Hex Single-Input NOT Gate – 1piece
7408 Quad 2-Input AND Gate – 1 piece
7432 Quad 2-Input OR Gate – 1 piece
330-ohm register – 2 pieces
Light Emitting Diodes (LEDs) – 2 pieces
DC Power Supply

Theory:

Exclusive-OR (X-OR) Logic: For an exclusive-OR gate, the output is HIGH if and only if one of the inputs is HIGH. If both the inputs are LOW or HIGH, then the output is LOW. The logic symbol for X-OR has been shown below:

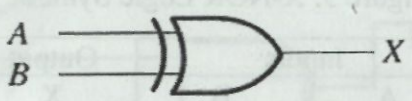

Figure 1: X-OR Logic Symbol

Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

Table : X-OR Truth Table

If A and B are the inputs of the XOR gate, the output expression is given as:

$$X = A\overline{B} + \overline{A}B$$

Although exclusive-OR gate is considered a type of logic gate with its own unique symbol, it is a combination of two AND gates, one OR gate, and two inverters, as shown in Figure:

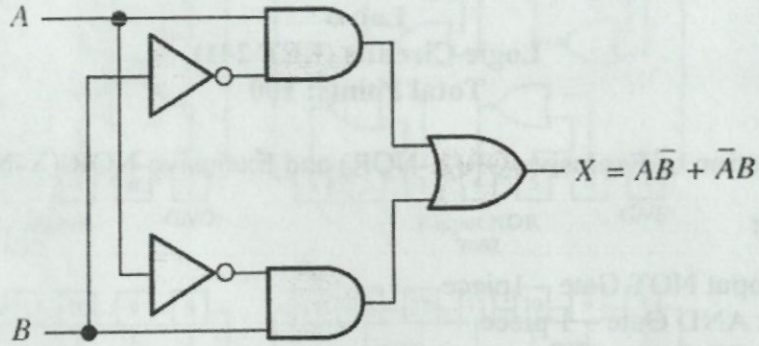

Figure 2: X-OR Logic Diagram

Exclusive-NOR (X-NOR) Logic: For an exclusive-NOR gate, output will be HIGH when both the inputs are not same and will become LOW for different combination of input. The logic symbol for X-NOR has been shown below:

Figure 3: X-NOR Logic Symbol

Inputs		Output
A	B	X
0	0	1
0	1	0
1	0	0
1	1	1

Table : X-NOR Truth Table

If A and B are the inputs of the X-NOR gate, the output expression is given as:

$$X = \overline{AB} + AB$$

Although exclusive-NOR gate is considered a type of logic gate with its own unique symbol, it is a combination of two AND gates, one OR gate, and two inverters, as shown in Figure:

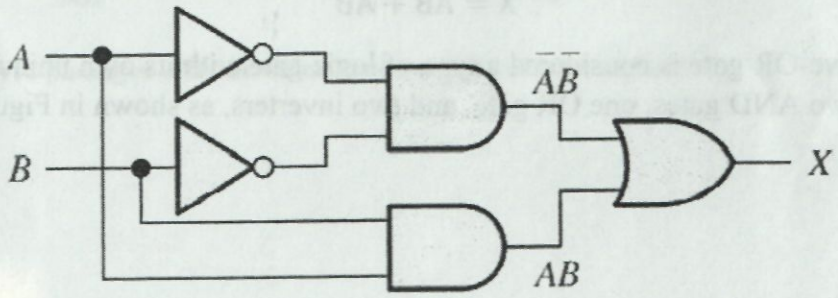

Figure 4: X-NOR Logic Diagram

Procedure:

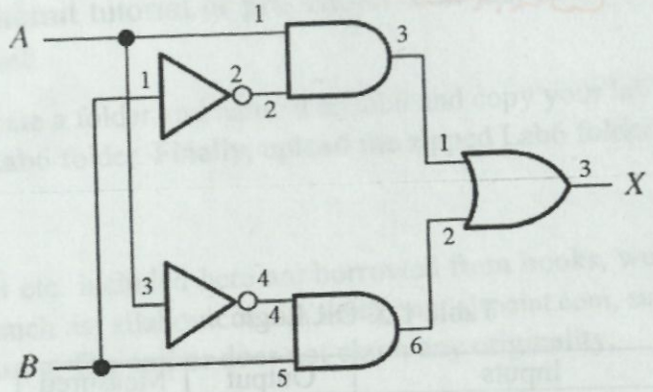

Figure 5: Connection for X-OR Logic

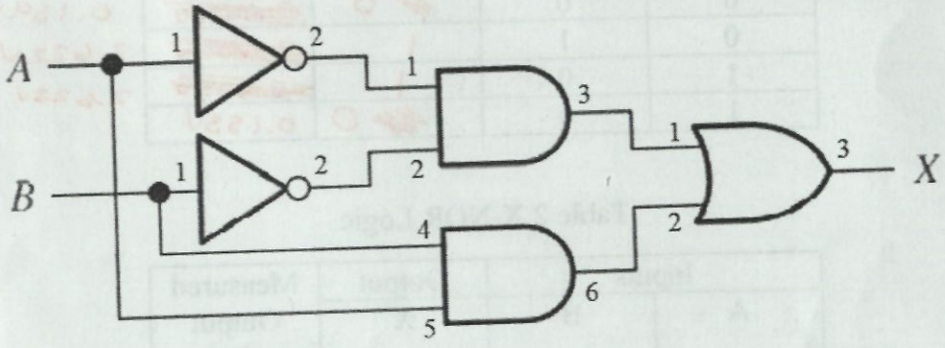

Figure 6: Connection for X-NOR Logic

1.

a) Find the pin diagram for the 7404, 7408, and 7432 IC (pin diagram for each IC has been provided). Apply V_{cc} and ground to the appropriate pins (Connect pin 7 to ground (0V) and pin 14 to V_{cc} =+5V). **For X-OR logic implementation**, connect the circuit according to connection diagram above (Figure 5).

a) You need to connect output pin (X) to a 330-ohm register, and the other end of the 330-ohm register will be connected to the positive terminal of LED. Finally, the negative terminal of the LED will be connected to ground (OV). If the output is logic 1, LED will turn ON and if the output is logic 0, LED will turn OFF.

b) Test the circuit by connecting all possible combinations of inputs, as listed in Table 1 of the report. Apply a logic 1 by connecting to V_{cc} and a logic 0 by connecting directly to ground. Use digital multimeter (DMM) to measure the output voltage.

2. Repeat step 1 for **X-NOR logic implementation**. In this case, you need to use Figure 6. Tabulate your results in Table 2.

Lab 6 Report

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Data and Observations:

Table 1 X-OR Logic

Inputs		Output	Measured Output voltage
A	B	X	
0	0	0	0.159V
0	1	1	2.622V
1	0	1	2.623V
1	1	0	0.155V

Table 2 X-NOR Logic

Inputs		Output	Measured Output voltage
A	B	X	
0	0	1	2.625V
0	1	0	0.154V
1	0	0	0.154V
1	1	1	2.623V

Submission Process

You do not need to submit tutorial or procedure. You just need to submit lab report and screenshot of the circuit.

I would suggest you create a folder and name it as lab6 and copy your lab report and screenshots. Then you will zip the Lab6 folder. Finally, upload the zipped Lab6 folder on the blackboard.

Note: The figures, text etc. included here are borrowed from books, websites, author pages and other internet sources such as: allaboutcircuits.com, tutorialspoint.com, sullystationtechnologies.com for academic purpose only. The author does not claim any originality.

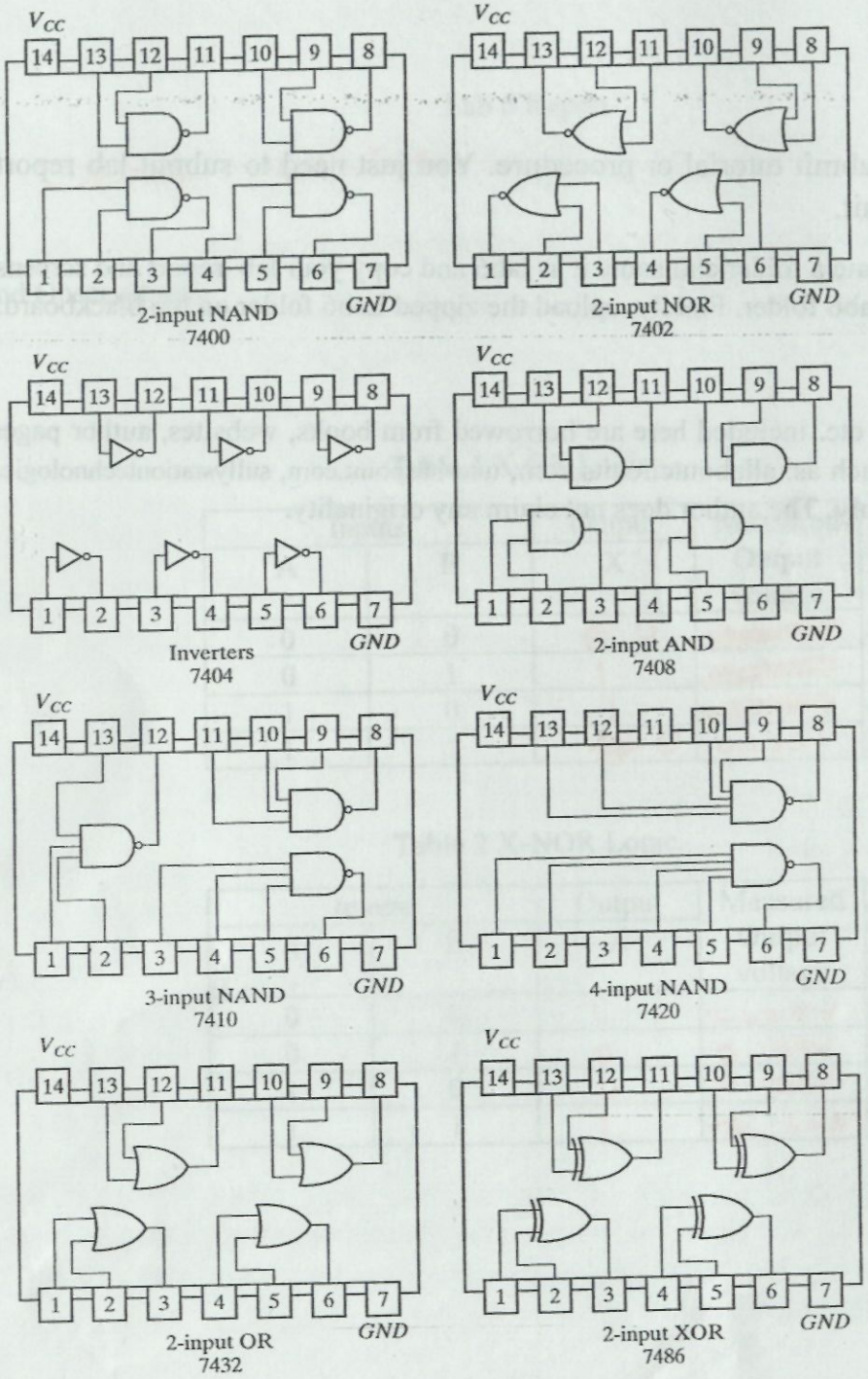

FIGURE 9.1
Digital gates in IC packages with identification numbers and pin assignments