Lab 5

First Stage

Intelligent Medical Systems Department

Logic Design

Lab 5: The Exclusive-NOR Gate

By

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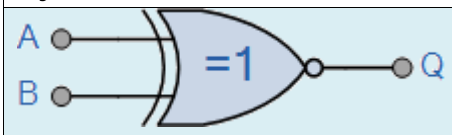
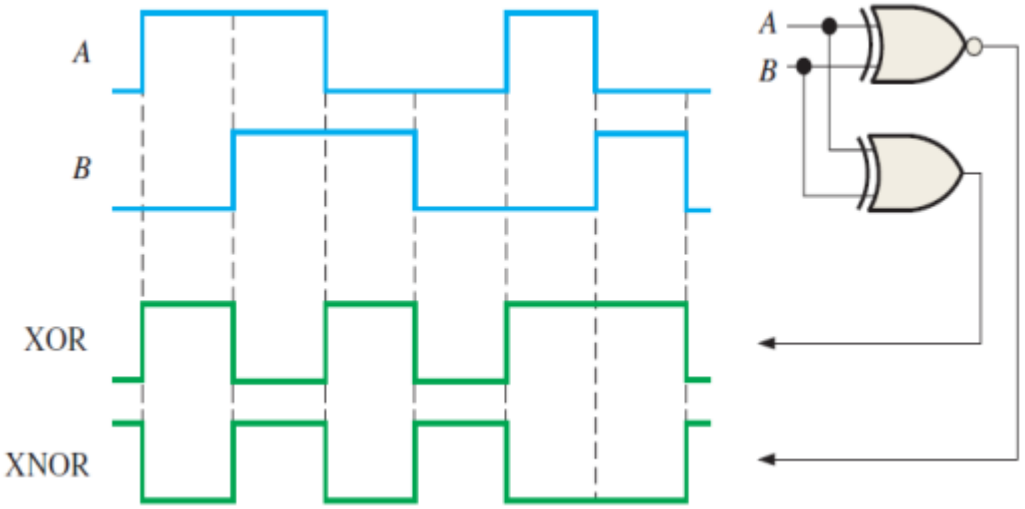
1. The Exclusive-NOR Gate

The Exclusive-NOR gate is equivalent to X-OR gate followed by NOT gate. Standard symbols for an Exclusive-NOR (X-NOR) gate and Boolean expression for the output of a 2-input X-NOR gate can be written as:

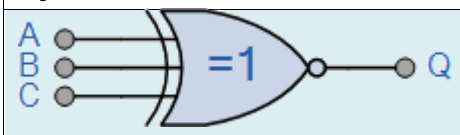
$$Q = \overline{A}\,\overline{B} + AB = \overline{A + B}$$

2-input X-NOR Gate

Symbol	**Truth Table**		
 **2-input X-NOR Gate**	B	A	Q
	0	0	1
	0	1	0
	1	0	0
	1	1	1
Boolean Expression $Q = \overline{A \oplus B}$	Read if A **AND** B the **SAME** gives Q		



3-input XNOR Gate

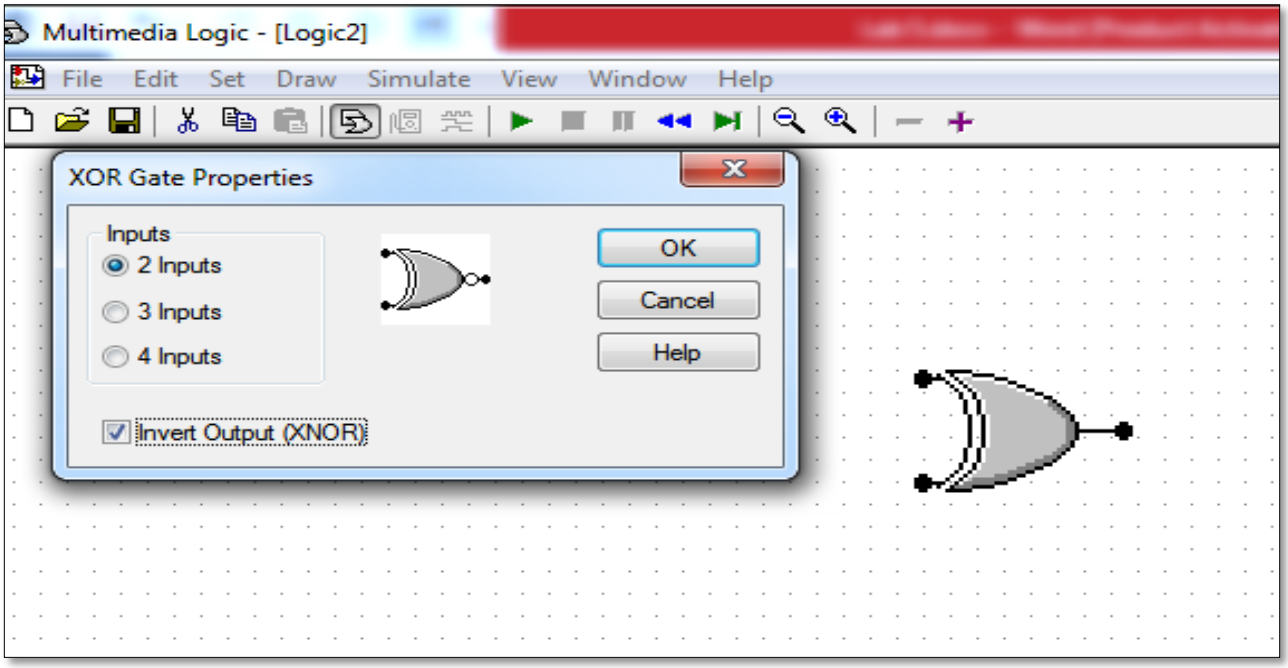
Symbol	**Truth Table**			
 **3-input XNOR Gate**	C	B	A	Q
	0	0	0	1
	0	0	1	0
	0	1	0	0
	0	1	1	1
	1	0	0	0
	1	0	1	1
	1	1	0	1

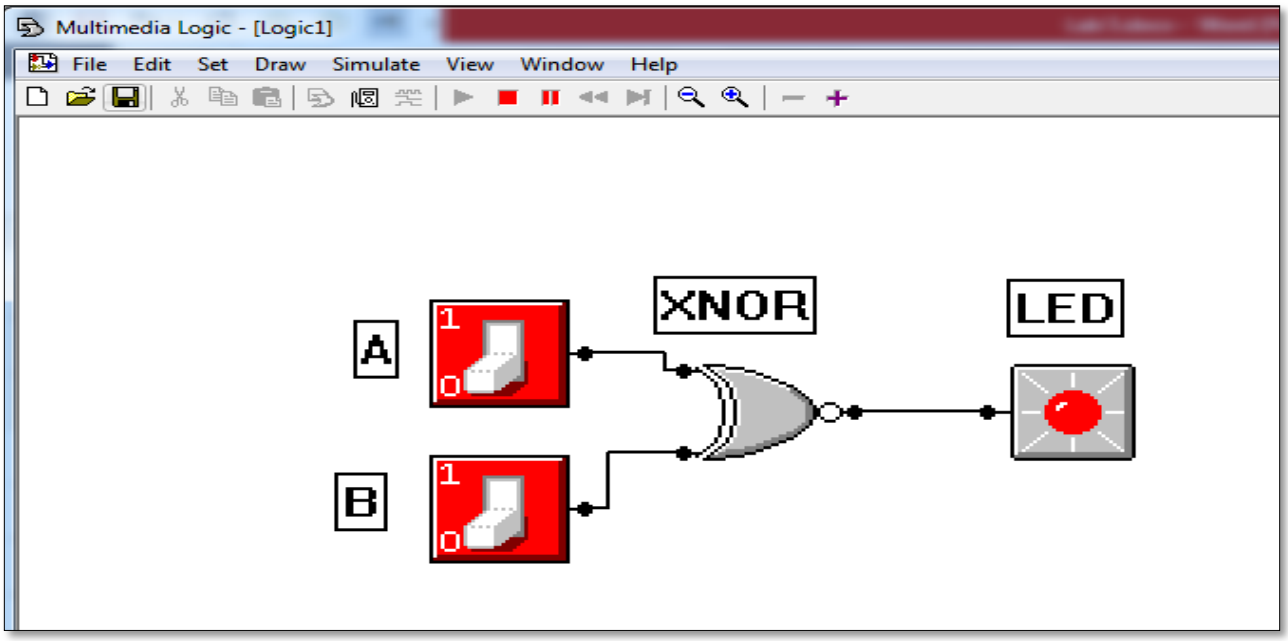
	1	1	1	0
Boolean Expression $Q = \overline{A \oplus B \oplus C}$	Read as "any **EVEN** number of Inputs" gives Q			

Giving the Boolean expression of: $Q = \overline{ABC} + AB\overline{C} + A\bar{B}C + \bar{A}BC$

2. Implementation

2-input XNOR Gate



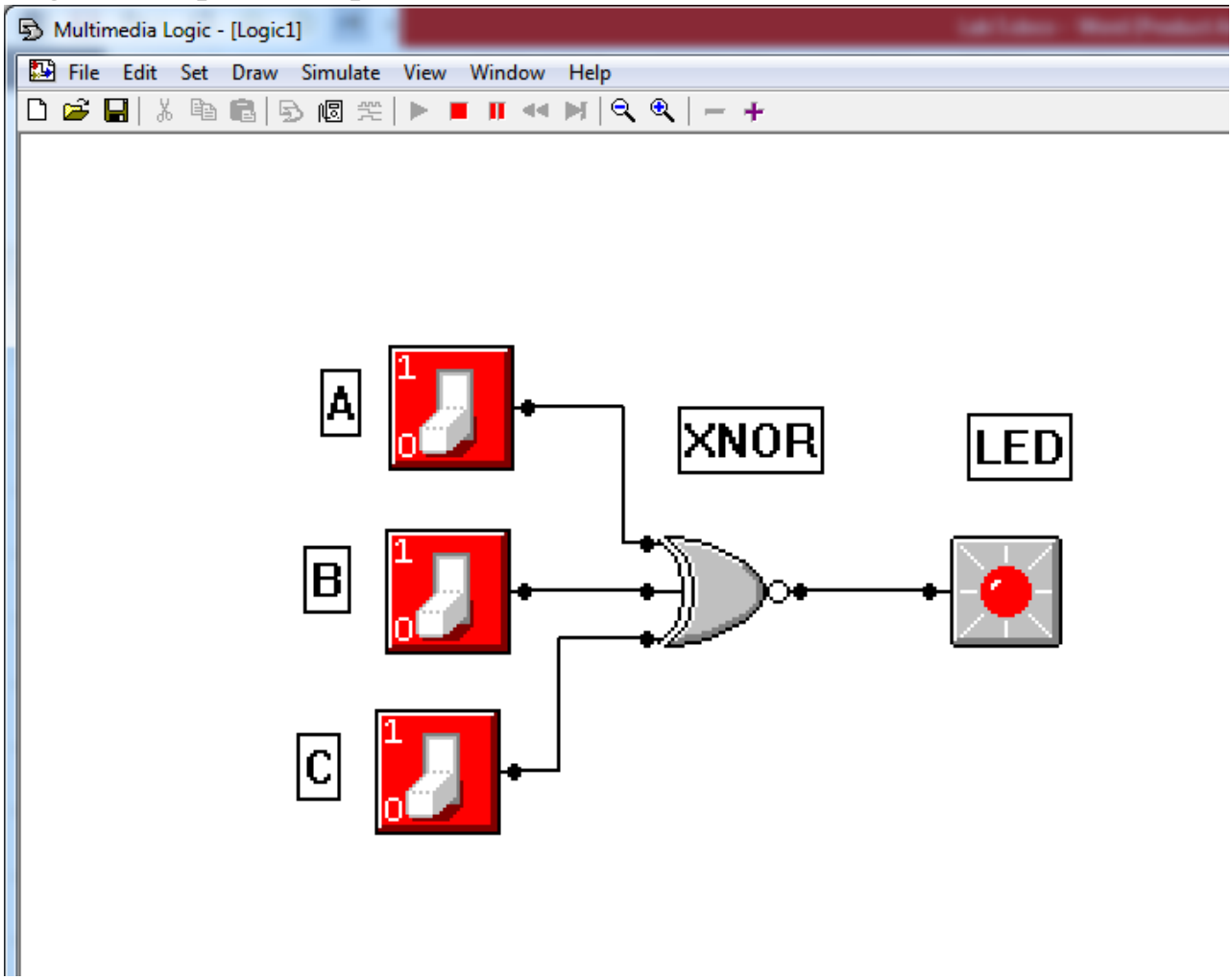


Truth Table

Switches		LED
0	0	Lit / 1
0	1	Dark / 0
1	0	Dark / 0
1	1	Lit / 1

XNOR is short for **Exclusive Nor**. This gate combines a **Xor Gate** with its output connected through an **Inverter Gate** in one device. The output of this gate is a **"0"** only if **one** of its inputs is a **"1"**

Negative Triple of 3-input XNOR Gate



Truth Table

Switches			LED
0	0	0	Lit / 1
0	0	1	Dark / 0
0	1	0	Dark / 0
0	1	1	Lit / 1
1	0	0	Dark / 0
1	0	1	Lit / 1
1	1	0	Lit / 1
1	1	1	Dark / 0

XNOR is short for **Exclusive Nor**. This gate will output a **"0"** if only **one** or **all** of its inputs are a **"1"**