



AROR UNIVERSITY  
OF ART, ARCHITECTURE,  
DESIGN & HERITAGE,  
SUKKUR, SINDH

## **Faculty of Artificial Intelligence & Multimedia Gaming**

BS – Artificial Intelligence (Section A and B)

Digital Logic Design Lab

### **Lab # 08: Comparator**

Mr. Abdul Ghafoor

#### **Submission Profile**

Name:

Submission date (dd/mm/yy):

Marks obtained:

Comments:

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Instructor

### Lab Learning Objectives:

Upon successful completion of this experiment, the student will be able:

- To implement 1-bit comparator circuit in the Multisim
- To implement 4-bit comparator using 74HC85/74LS85 IC on **NI ELVIS-II**
- To cascade **2** 74HC85/74LS85 ICs to implement 8-bit comparator on **NI ELVIS-II**
- Recognize that comparators can be constructed with logic gates or chips that can be combined if/when the number of bits increases
- Reflect on the similarities and differences between adders and comparators

### Lab Hardware and Software Required:

<i>Platform: NI ELVIS III</i>	<ul style="list-style-type: none"><li>✓ View User Manual: <a href="http://www.ni.com/en-us/support/model.ni-elvis-iii.html">http://www.ni.com/en-us/support/model.ni-elvis-iii.html</a></li><li>✓ View Tutorials: <a href="https://www.youtube.com/playlist?list=PLvcPIuVaUMIWm8ziaSxxv0gwtshBA2dh_M">https://www.youtube.com/playlist?list=PLvcPIuVaUMIWm8ziaSxxv0gwtshBA2dh_M</a></li></ul>
<i>Software: NI Multisim 14.0.1 Education Version or newer</i>	<ul style="list-style-type: none"><li>✓ Install Multisim: <a href="http://www.ni.com/gate/gb/GB_ACADEMICEVALMULTISIM/US">http://www.ni.com/gate/gb/GB_ACADEMICEVALMULTISIM/US</a></li><li>✓ View Help: <a href="http://www.ni.com/multisim/technical-resources/">http://www.ni.com/multisim/technical-resources/</a></li></ul>

## Background Theory:

### What are Magnitude Comparators?

1-Bit Comparator Truth Table				
Inputs		Outputs		
A	B	A>B	A=B	A<B
0	0	0	1	0
1	0	1	0	0
0	1	0	0	1
1	1	0	1	0

Compare word A and word B:

- A=B
- A>B
- A<B

The A=B column is equivalent to an XNOR gate

Figure 1-1 Video. View the video here: <https://youtu.be/BP5G3n9dmYA>



#### Video Summary

- The A = B column in the truth table is equivalent to an XNOR gate
- Large cascading comparators have 4-bit inputs

In its simplest terms, *comparators* are combinational logic circuits that are used to test whether word A is less than (<), equal to (=) or greater than (>) word B. Comparators that determine whether one value is less than, equal to or greater than another are called magnitude comparators. The truth table for a 1-bit digital *magnitude comparator* can be seen below:

Inputs		Outputs		
A	B	A>B	A=B	A<B
0	0	0	1	0
1	0	1	0	0
0	1	0	0	1
1	1	0	1	0

Figure 1-2 Truth table

### **Lab Activities 01:**

Implement: Building a 1-bit Comparator on Multisim using gates and verify the truth table

- Take a screenshot and include it with your completed lab

### **Lab Activities 02:**

□ Implement 4-bit comparator circuit on Multisim

□ Take a screenshot and include it with your completed lab