

## **EEE-1212:Digital Logic Design Lab**

1<sup>st</sup> Year 2<sup>nd</sup> Semester

Session: 2015-2016

**Experiment Number: 09**

**Name of the Experiment:**

Implementation of a) 2-4 bit b) 3-8 bit Decoder using 74139

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**Submitted to:**

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**Experiment name:**

Implementation of Decoder using IC 74LS139.

- a) 2-4 bit
- b) 3-8 bit

**Objectives:**

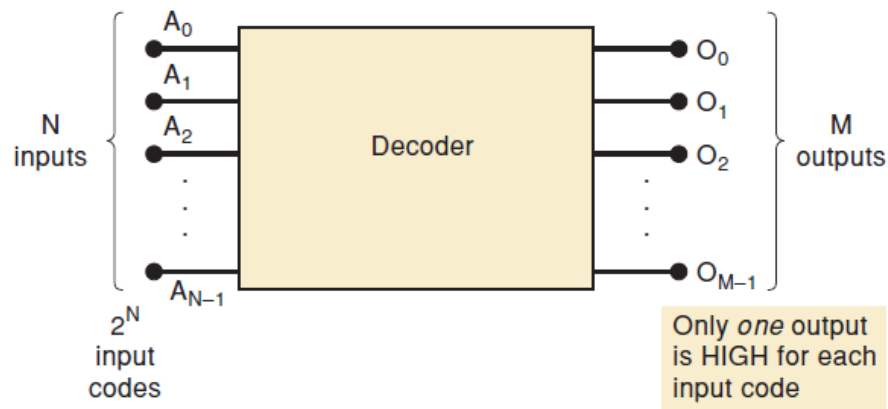
The objective of this lab is to implement the circuit of 2 to 4 bit decoder and 3-8 bit decoder using 74LS139.

**Theory:**

A decoder is a logic circuit that accepts a set of inputs that represents a binary number and activates only the output that corresponds to that input number. In other words, a decoder circuit looks at its inputs, determines which binary number is present there, and activates the one output that corresponds to that number; all other outputs remain inactive. If a decoder has  $N$  input number and it has  $M$  output numbers. Each of the  $N$  inputs can be 0 or 1, so there are  $2^N$  possible input combinations or codes. For each of these input combinations, only one of the  $M$  outputs will be active (HIGH); all the other outputs are LOW.

If a decoder has 2 input lines then it has 4 outputs. Similarly if a decoder has 3 input lines then it has 8 outputs and so on. It uses all AND gates, and so the outputs are active-HIGH. Note that for a given input code, the only output that is active (HIGH) is the one corresponding to the decimal equivalent of the binary input code (e.g.,  $O_6$  output goes HIGH only when  $CBA = 110_2 = 6_{10}$ ).

This decoder can be referred to in several ways. It can be called a 3-line to-8-line decoder because it has three input lines and eight output lines. It can also be called a binary-to-octal decoder or converter because it takes a threebit binary input code and activates one of the eight (octal) outputs corresponding to that code. It is also referred to as a 1-of-8 decoder because only 1 of the 8 outputs is activated at one time.



### **Instruments:**

- i) A trainer board
- ii) 2 IC(s) IC-7400, IC- 74139
- iii) Connecting wires.

### **Procedure:**

- I. At first we placed the integrated circuit with Decoder IC (IC-74139) on a breadboard properly. All of these components is placed across the gap in the center of the breadboard.
- II. Then we placed Not gate(IC- 7400) on a breadboard properly.
- III. Then we constructed the 2-4 bit decoder circuit . For this we connected the inputs of the logic gate to the logic sources and its output to the logic indicator. We also made enable input 0.
- IV. Gave biasing to the ICs with the VCC(5 volt) and GND(0 volt), and do necessary connections according to the circuit diagram
- V. For various input combinations we observe the output for each one is applied .
- VI. Then we constructed 3-8 bit IC in the similar way. But to make 3 to 8 bit decoder IC we have to 2 to 4 bit IC two times. So we have to connect two decoders among themselves. So this we use have to use NOT gate IC to invert the ENABLE input.
- VII. Then we again check the output for various input combination. The output for each logic gate will be on an LED. (LED Off = 0, LED On = 1).

## Result:

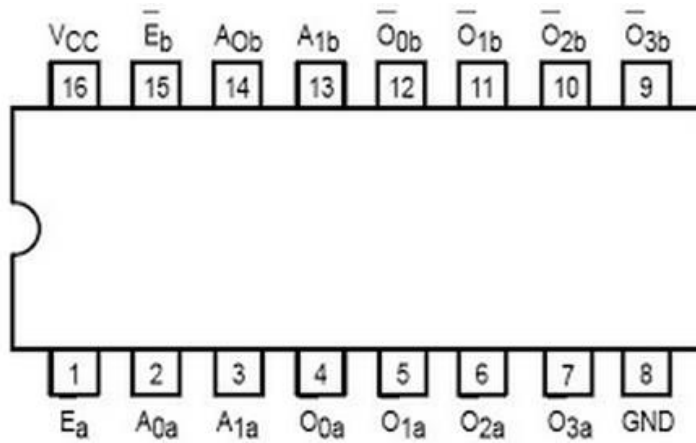


Fig: IC- 73139 pin configuration

a) 2 to 4 bit decoder:

Input		Output			
I <sub>0</sub>	I <sub>1</sub>	O <sub>3</sub>	O <sub>2</sub>	O <sub>1</sub>	O <sub>0</sub>
0	0	0	0	0	1
0	1	0	0	1	0
1	0	0	1	0	0
1	1	1	0	0	0

b) 3 to 8 bit decoder:

Input			Output							
C	B	A	O <sub>7</sub>	O <sub>6</sub>	O <sub>5</sub>	O <sub>4</sub>	O <sub>3</sub>	O <sub>2</sub>	O <sub>1</sub>	O <sub>0</sub>
0	0	0	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	0	0	1	0
0	1	0	0	0	0	0	0	1	0	1
0	1	1	0	0	0	0	1	0	0	0
1	0	0	0	0	0	1	0	0	0	0
1	0	1	0	0	1	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0

### **Discussion:**

In this experiment we have to verify IC – 74139 and implement the circuit of 2-4 bit decoder and 3-8 bit decoder. but we faced some problem during the experiment.

- i) We implement the 2-4 bit decoder circuit successfully but at first we don't understand how we can implement 3 to 8 bit decoder circuit using 2 to 4 bit decoder IC. So we need a little bit more to complete the experiment.
- ii) While doing the experiment, we found some inconsistencies with the trainer board. Some connection points were too tight and some were too loose. As a result we had difficulties inserting the wires and maintaining the proper connections.

But we figured them out and completed our experiment successfully.