# EXPERIMENT 4--MSI COMBINATIONAL LOGIC

# FINAL REPORT

**I. *Binary Adder/Subtracter***

 a). Sketch the logic diagram for your adder/subtracter circuit below:

 b). Complete the following table of additions and subtractions performed by your circuit. Indicate whether or not the carry/borrow LED is on (1) or off (0) and the "digit" in the LED display. Are the results correct? Demonstrate to your TA that the table is completed based on your circuit behavior. Your TA must initialize the completed table.

|  |  |  |  |
| --- | --- | --- | --- |
| Addend/Minuend | Augend/Subtrahend | carry SUM | carry DIFFERENCE |
| 0011 | 0101 |  |  |  |  |
| 0010 | 1110 |  |  |  |  |
| 1000 | 0111 |  |  |  |  |
| 1001 | 0101 |  |  |  |  |
| 0101 | 0110 |  |  |  |  |
| 1111 | 0110 |  |  |  |  |
| 0110 | 1111 |  |  |  |  |
| 0000 | 1000 |  |  |  |  |

 c). Draw the "digit" on the LED display that corresponds to each 4-bit input to the 7447 BCD-to-seven segment decoder/driver.

 d). Sketch the displays observed on the oscilloscope when trying to determine the maximum propagation delay *from any input of your circuit to the decoder/driver*. Indicate the longest path on your logic diagram shown in part 1 above.



**LOW to HIGH Output Transition**



**HIGH TO LOW Output Transition**

e). What is the maximum propagation delay?

**II. *Conclusion***

Comment on the advantage and disadvantage of this approach to constructing a subtracter using an adder as opposed to constructing a separate subtracter circuit.