

# ECE 204L - BOOLEAN ALGEBRA - LAB 5

## THE DISTRIBUTIVE LAW

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A.P. FELZER

### OBJECTIVE

The objective of this lab is to verify the distributive law of Boolean Algebra.

### LAB

1. **Prelab** - Draw chip diagrams for AND and OR gates
2. The objective of this problem is to verify the distributive law equation

$$W \cdot (X + Y) = W \cdot X + W \cdot Y$$

- a. **Prelab** - Draw a logic diagram with pin numbers to implement F1 as follows with AOI (and-or-inverter) gates.

$$F1 = W \cdot (X + Y)$$

Be sure to include the **DIP switch circuits** like the one in Problem (5) of Lab (4) for controlling the inputs in this and all other logic and chip diagrams

- b. **Prelab** - Draw the chip diagram with DIP switches for W, X and Y and LED's to indicate outputs. Be sure to include all the resistors.
- c. Build your circuit for F1 and then measure its truth table
- d. **Prelab** - Draw a logic diagram with pin numbers to implement F2 as follows with AOI gates

$$F2 = W \cdot X + W \cdot Y$$

- e. **Prelab** - Draw the chip diagram with DIP switches for W, X and Y and LED's to indicate outputs. Be sure to include all the resistors.
- f. Build your circuit for F2 and then measure its truth table
- g. Make use of your results in parts (c) and (f) to verify that  $W \cdot (X + Y) = W \cdot X + W \cdot Y$

3. The objective of this problem is to verify the distributive law equation

$$W + X \cdot Y = (W + X) \cdot (W + Y)$$

- a. **Prelab** - Draw a logic diagram with pin numbers to implement F3 as follows with AOI (and-or-inverter) gates

$$F3 = W + X \cdot Y$$

- b. **Prelab** - Draw the chip diagram with DIP switches for W, X and Y and LED's to indicate outputs. Be sure to include all the resistors.
- c. Build your circuit for F3 and then measure its truth table
- d. **Prelab** - Draw a logic diagram with pin numbers to implement F4 as follows with AOI gates

$$F4 = (W + X) \cdot (W + Y)$$

- e. **Prelab** - Draw the chip diagram with DIP switches for W, X and Y and LED's to indicate outputs. Be sure to include all the resistors.
- f. Build your circuit for F4 and then measure its truth table
- g. Make use of your results in parts (c) and (f) to verify that  $W + X \cdot Y = (W + X) \cdot (W + Y)$