Lab #20 Name: _____ Per: _____

Title: HALF & FULL SUBTRACTORS

Materials:
[1] 7404 hex inverter IC
[1] 7486 2-input XOR gate IC
[1] 7408 2-input AND gate IC
[1] 7432 2-input OR gate IC

Procedure:
1. **Draw** a logic symbol of the half subtractor illustrated in Fig. 20-a. Use and inverter, XOR, and AND gates.
2. Insert the 7404, 7486, and 7408 ICs into the breadboard and wire the circuit you drew in step 1.
3. Operate and record the results in Table 20-a.
4. **Draw** a logic symbol of the full subtractor illustrated in Fig. 20-b. Use an inverter, XOR, AND, and OR gates.
5. Wire the full subtractor you drew in step 4. Use three input switches for B_{in}, A, and B.
6. Operate and record the results in Table 20-b.

Questions (answer on a separate piece of paper – **"Draw" means you must use a template**):

1. Compared with the logic diagram of a half adder, the subtractor contains one extra _____ (AND, inverter, OR, XOR) gate.
2. What is the purpose of the B_o output and the B_{in} input on a full subtractor?
3. Write the Boolean expressions for the half subtractor.

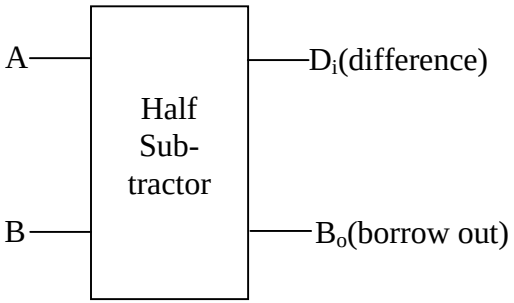

Fig. 20-a

Inputs		Outputs	
A	B	D_i	B_o
0	0		
0	1		
1	0		
1	1		

Table 20-a

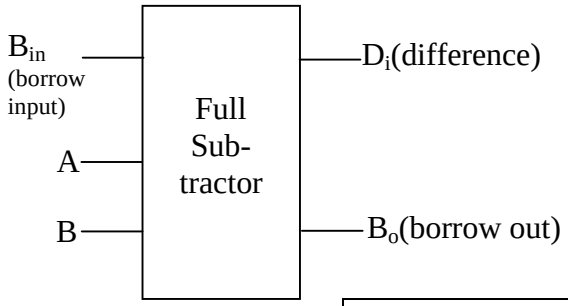

Fig. 20-b

Inputs			Outputs	
A	B	B_{in}	D_i	B_o
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Table 20-b