Note Title 3/1/2009

Circuit Instructions

- PLEASE ATTEND CLASS TO GET YOUR KIT. ROLL WILL BE TAKEN.
- The "check-off" procedure is that you bring your completed circuit to class on the check-off day.
- Also, for "check-off" bring your written, circuit report with stapled, signed circuit cover-sheet.
- The report *must* be neatly drawn with the template provided in the circuit kit or with a drawing program (Visio, or whatever you want).
- YOUR REPORT MUST ACCOMPANY YOUR CIRCUIT FOR CHECK-OFF
- ALL CIRCUITS MUST BE COMPLETED TO GET A PASSING GRADE IN THE COURSE.
- Students enjoy the circuits, which are easy and fun to build!

— use the circuit schematic on the web site as a guide. You are not required to provide complete schematics for all LEDs

Circuit Lecture and Due Dates Instructions

- **Circuit 1 due Wednesday, March 4**

Describe in English with references to your schematics why the LED is on/off when the switch is off/on.

Bring in your completed kits to class on Wednesday, March 4!

HW 4 due Friday

Instructions

- Show all your steps--answers alone are not sufficient.
- Homework must be done neatly.
- Use straight-edged paper (no notebook tear-outs with ragged edges).
- Please STAPLE papers to a signed cover sheet.

Homework Problems

Problem 5.4 (a). Plot the expression on a 4-variable K-map. (10 points)

Problem 5.4 (b). Simplify the K-map from 5.4 (a) into SOP form. Begin with a fresh map. (10 points)

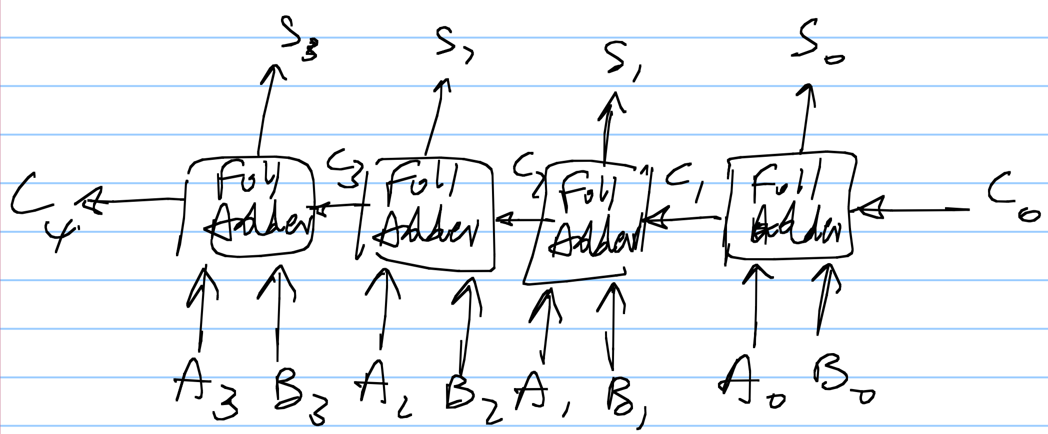
Problem 5.4 (c). Simplify the K-map from 5.4 (a) into POS form. Begin with a fresh map. (10 points)

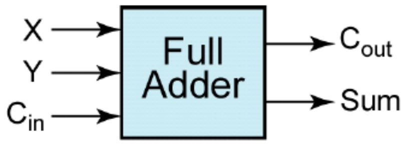
Problem 5.6 (a). To work, use guideline summary from class; ignore “essential prime implicants.” (20 points)

Problem 5.8 (a). (Note that the problem asks for both SOP and POS simplifications.) (20 points)

Problem 5.12 (c). (POS simplification.) (10 points)

Problem 5.21 (b). (Note that POS form is requested even though the problem statement is given in min-terms.) Plot the min-term map, then redraw with 0’s, and group the 0’s. (20 points)





X	Y	C_{in}	C_{out}	Sum
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

Figure 4-4: **Truth Table for a Full Adder**

$Sum = \sum m(1,2,4,7) =$

$= X'Y'C_{in} + X'YC_{in} + XY'C'_{in} + XYC_{in} =$

$= X'(Y'C_{in} + YC'_{in}) + X(Y'C'_{in} + YC_{in}) =$

$= X'(Y \oplus C_{in}) + X(Y \equiv C_{in}) =$

$= X'(Y \oplus C_{in}) + X(Y \oplus C_{in})' =$

$= X \oplus (Y \oplus C_{in}) =$ ([3-13]: associativity of exclusive-or) $= X \oplus Y \oplus C_{in}$

$C_{out} = \sum m(3,5,6,7) = X'YC_{in} + XY'C_{in} + XYC'_{in} + XYC_{in} =$

$= (X'YC_{in} + XYC_{in}) + (XY'C_{in} + XYC_{in}) + (XYC'_{in} + XYC_{in}) =$

$= YC_{in} + XC_{in} + XY$

Here are the resulting circuits:

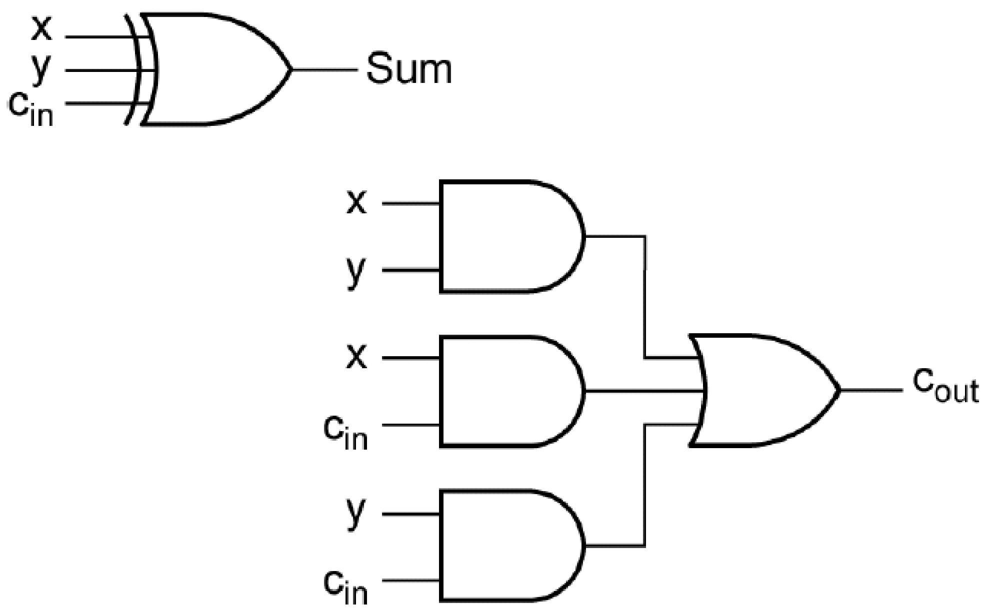


Figure 4-5: **Implementation of Full Adder**

Chapter 5 — motivation for Karnaugh maps technique

Ex. on p. 121 top. Find a minimum sum-of-product expression for $f(a,b,c) = \sum m(0, 1, 2, 5, 6, 7)$

$$F = a'b'c' + a'b'c + a'bc' + ab'c + abc' + abc$$

$$= a'b' + b'c + bc' + ab$$

?

$$f = a'b'c' + a'b'c + a'bc' + ab'c + abc' + abc$$

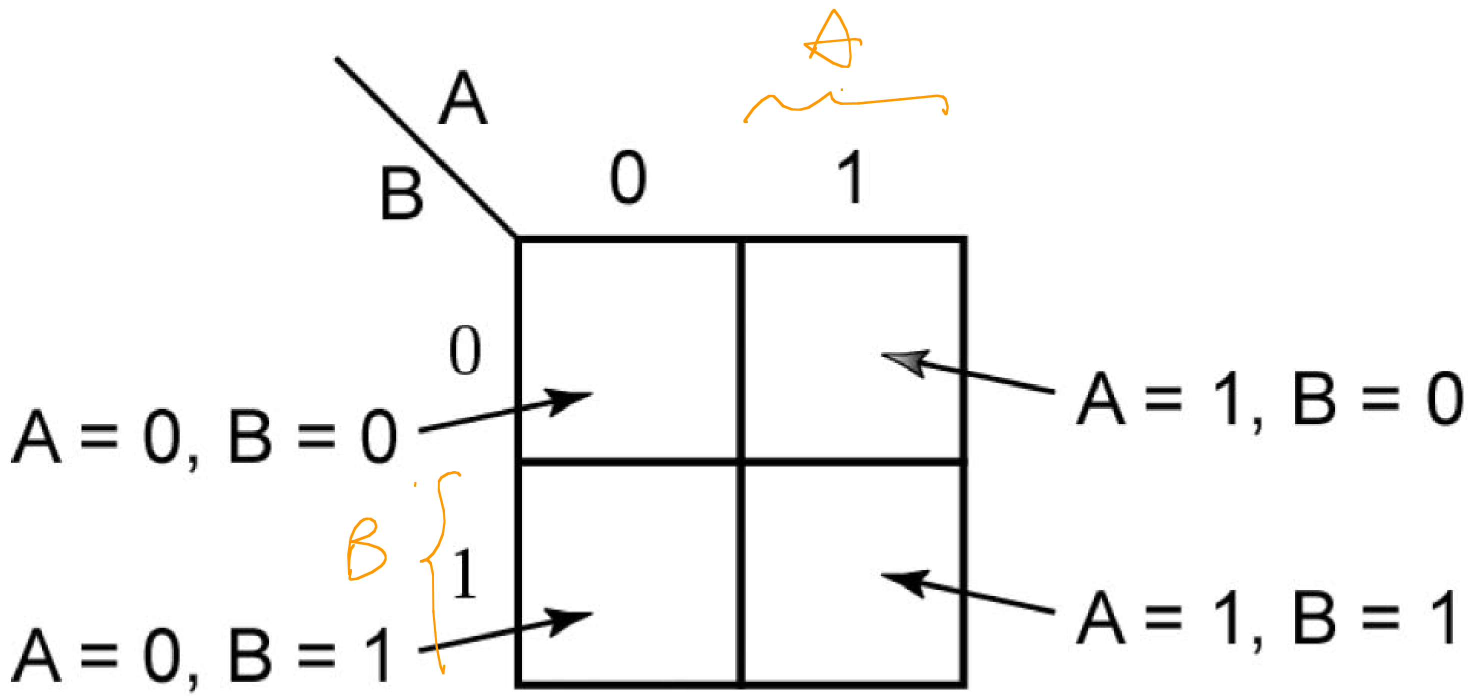
$$= a'b' + bc' + ac$$

abc	ab + b'c	ac
000	0	0
001	1	0
010		0
011		0
100		
101		
110		
111		

Unfortunately, there is no (easy?) way of achieving ✱ from ▦ without backtracking, using the laws & theorems of p. 52!

Chapter 5

A [illegible] for two variables (A and B)

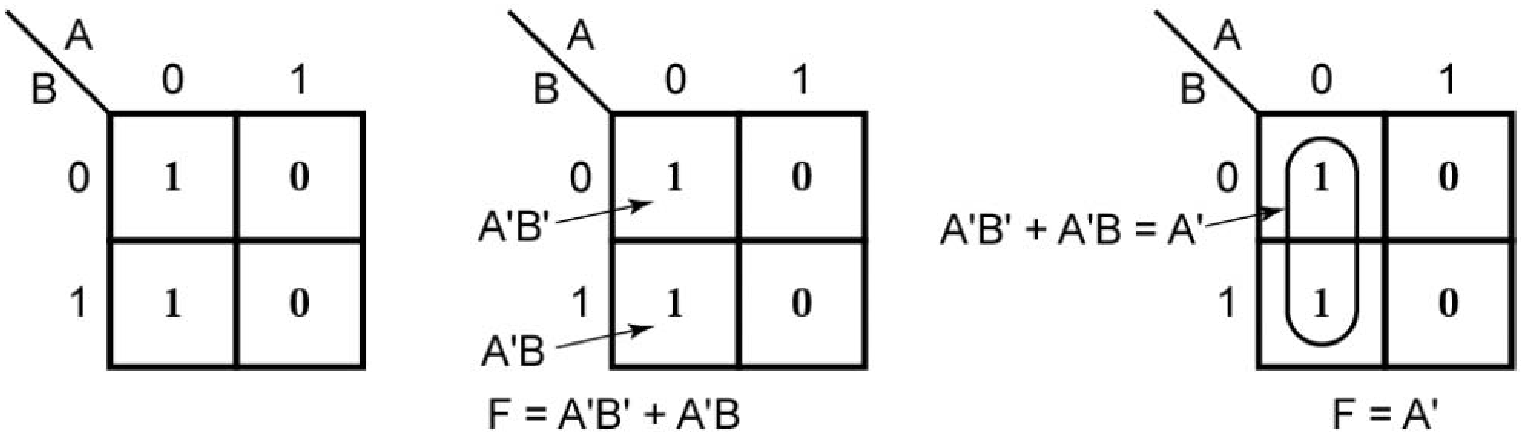


Veitch diagram (alternate labeling)

Section 5.2, p. 121

(a)

A	B	F
0	0	1
0	1	1
1	0	0
1	1	0

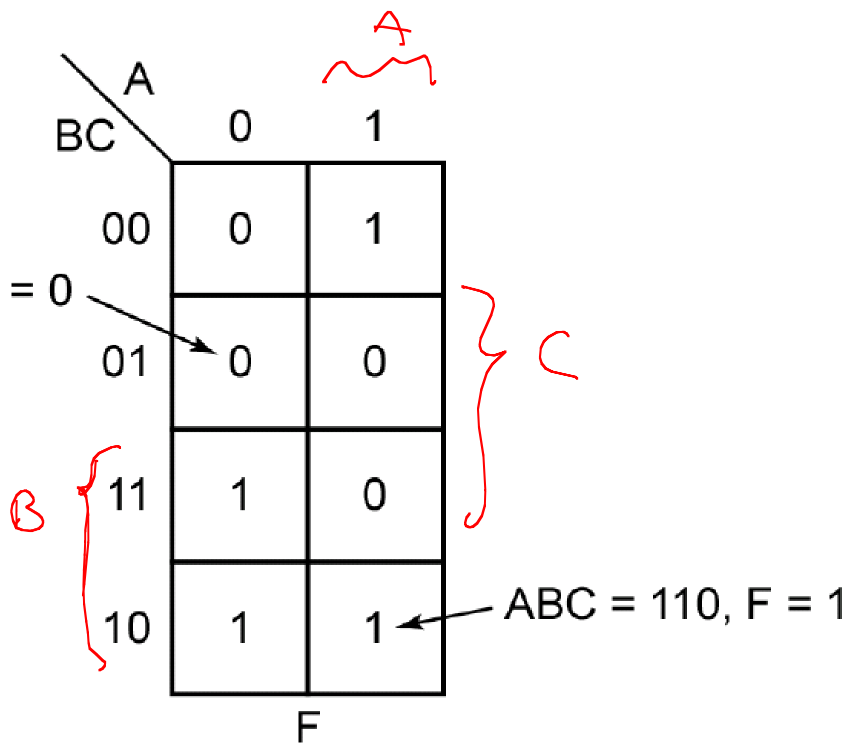


(b) (c) (d)

Figure 5-1a, b, c, and d

A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

(a)



(b)

Figure 5-2: **Karnaugh Map for Three-Variable Function**

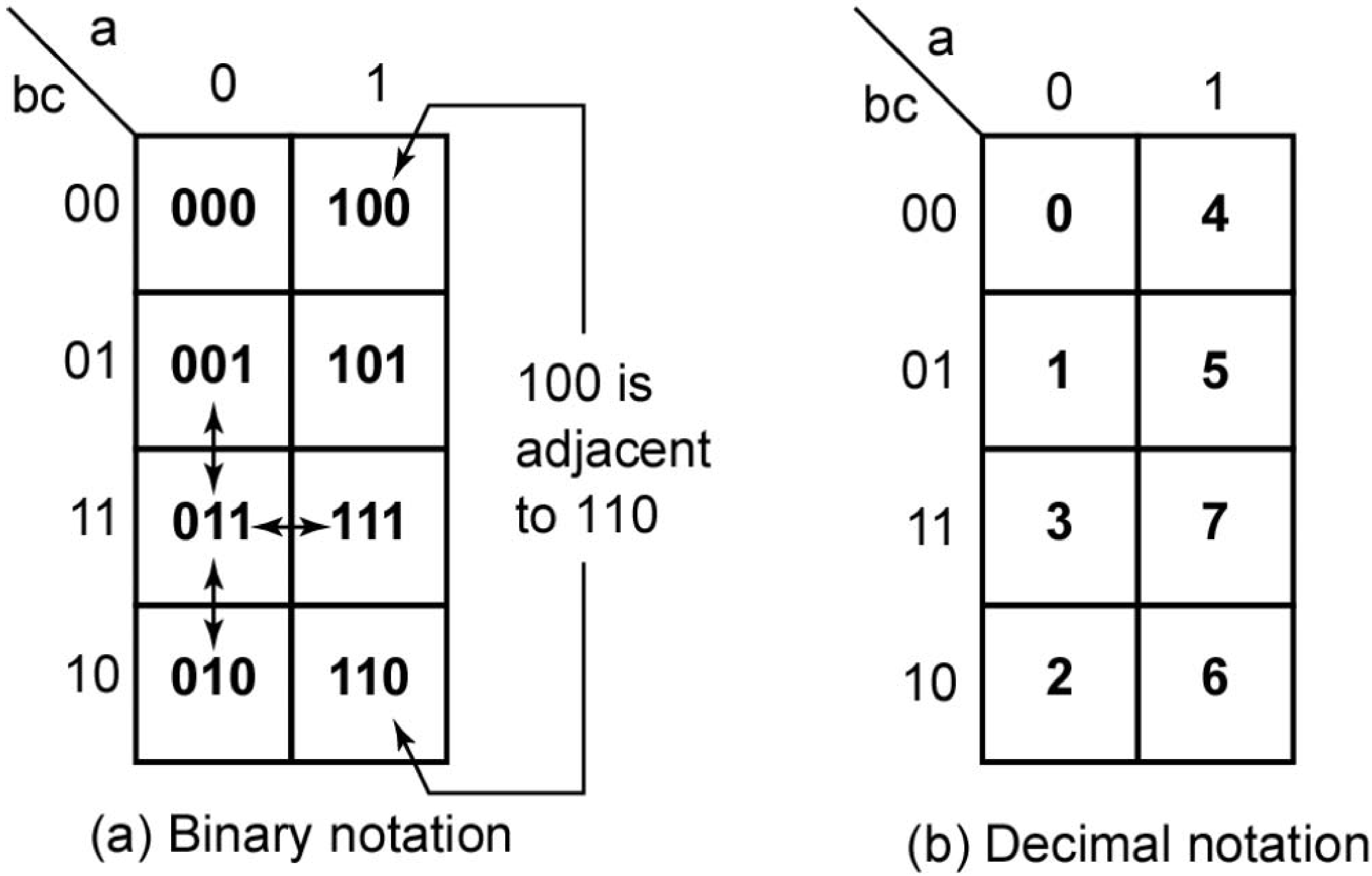


Figure 5-3: **Location of Minterms on a Three-Variable Karnaugh Map**