Liam Spinner

CSE2120

Dr. Caraway

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#### Homework 3

### **Chapter 3**

a. Exercises 2, 6, 14a, 23,26, 40, 49, 51, 63 on pages 210-220

**Problems 23 & 26**: Please, read the questions carefully. The sum-of-products form is different from the

product-of-sums form. For example, problem 2a shows an expression in sum-of-products form whilst problem 2b is an example of the product-of-sums form.

**Problem 14**: Specify the identities used.

**Problem 26**: Show that FF'=0 and F+F'=1 by using the given expression of the F function.

Hence, show that 
$$(x'y + xyz')(x'y + xyz')' = 0$$
 and  $(x'y + xyz') + (x'y + xyz')' = 1$ 

**Problem 40**: You can only use the given gates, AND, OR and NOT to construct the XOR operator.

No **NAND** gate - In other words, do not use an AND gate followed by a NOT gate. No other gates.

Problem 63: Refer to the example *Null Pointers: Tips and Hints* on page 197.

Read all questions carefully.

#### 2. Construct a truth table for:

a. 
$$Xyz + x(yz)' + x'(y+z)+(xyz)'$$

Х	У	Z	xyz	X(yz)'	X'(y+z)	(xyz)'	Xyz+x(yz)'	X'(y+z)+(xyz)'	Xyz+x(yz)'+x'(y+z)+(xyz)'

0	0	0				1		1	1
0	0	1			1	1		1	1
0	1	0			1	1		1	1
0	1	1			1	1		1	1
1	0	0		1		1		1	1
1	0	1		1		1		1	1
1	1	0		1		1		1	1
1	1	1	1				1		1

# b. truth table for (x+y')(x'+z')(y'+z')

Х	у	Z	X+y'	X'+z'	Y'+z'	(x+y')(x'+z')	(x+y')(x'+z')(y'+z')
0	0	0	1	1	1	1	1
0	0	1	1	1	1	1	1
0	1	0		1	1		
0	1	1		1			
1	0	0	1	1	1	1	1
1	0	1	1		1		
1	1	0	1	1	1	1	1
1	1	1	1				

6. Using De Morgan's law, write an expression for the complement of F (F') given:

$$F'(x,y,z) = xz'(xy+xz)+xy'(wz+y)$$

$$= (xz'(xy+xz))(xy'(wz+y))$$

$$= (xz')(xy+xz)((xy')(xz+y))$$

$$= ((xy+z') + ((xy)(xz)(xz)) ((x'+y') + (wz)(x'))$$

$$= ((x'+z) + ((xy)(xz)(xz)(x'+y) + (wz)(x'))$$

$$= ((x'+z) + ((x'+y')(x'+z')) ((x'+y) + (w'+z')y')$$

$$= ((x'+z) + (x'+y')(x'+z')) ((x'+y) + (w'+z')y')$$

14a. Simplify using bool algebra and identities. List each identity as they are used.

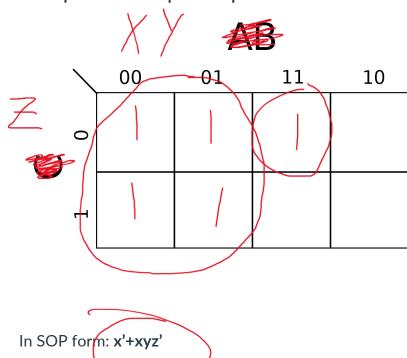
$$F(x,y,z) = y(x'+(x+y)')$$

De Morgan's = 
$$y(x'+x'y')$$

Absorptive = 
$$yx'$$

23. The truth table for a bool expression is shown. Write a bool expression in SOP form

Even though we haven't been taught in class, I am going to use a Kmap to make this process quicker



X	Υ	Z	F	
0	0	0	1	
0	0	1	1	
0	1	0	1	
0	1	1	0	
1	0	0	1	
1	0	1	1	
1	1	0	0	
1	1	1	0	

26. Given the bool function f(x,y,z) = x'y + xyz'

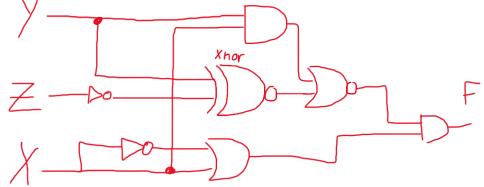
a. derive an algebraic expression for the complement of F in SOP form

De Morgan's: f = (x+y')'+(x'+y'+z')'

40. Construct the XOR operator using only AND, OR, and NOT gates

 $A\overline{B} + AB = A \oplus B$ 

# 49. Find the truth table for the following circuit:



Х	у	Z	ху	Xx'	Y xnor z'	Xy nor (y xnor z')	(xy nor (y xnor z')) xx'
0	0	0		0	1	1	0
0	0	1		0			0
0	1	0		0			0
0	1	1		0	1	1	0
1	0	0		0	1	1	0
1	0	1		0			0
1	1	0		0			0
1	1	1	1	0	1		0

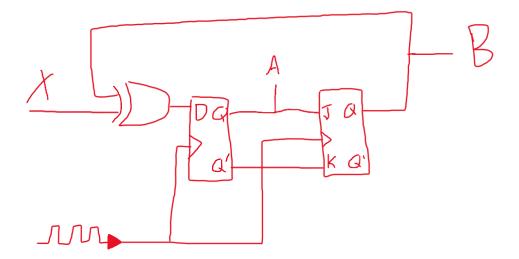
51. How many inputs does a decoder have if it has 64 outputs?

Basically asking 2 to what power = 64?

$$Log_264 = 6$$

### Answer is 6

63. Complete the truth table for the following sequential circuit



Α	В	X	Next A	Next B
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	0	0