CISC 341 - Spring 2017 Armani Willis
Assignment #3
Page 189-198
2. Construct a truth table for the following:
a) xyz + x(yz)' + x'(y+z) + (xyz)'

x	y	z	xyz	x(yz)'	x'(y+z)	(xyz)'
0	0	0				1
0	0	1			1	
0	1	0			1	
0	1	1			1	
1	0	0		1		
1	0	1				
1	1	0				
1	1	1	1			

b) (x + y')(x' + z')(y' + z')

x	y	z	x+y'	x'+z'	y'+z'
0	0	0		1	1
0	0	1			
0	1	0		1	
0	1	1			
1	0	0	1		1
1	0	1	1		
1	1	0			
1	1	1			

6. Using DeMorgan's Law, write an expression for the complement of F if F(x,y,z) = xz' (xy + xz) + xy'(wz + y)

x	y	z	w	xz'(xy+xz)	xy'(wz+y); xz'(xy+xz)=xyz'+x; xy'(wz+y)=xy'zw+x
0	0	0	0		
0	0	0	1		
0	0	1	0		
0	0	1	1		1
0	1	0	0	1	
0	1	0	1	1	
0	1	1	0		
0	1	1	1		
1	0	0	0		
1	0	0	1		
1	0	1	0		
1	0	1	1		1
1	1	0	0	1	
1	1	0	1	1	
1	1	1	0		
1	1	1	1		

12. Show that xz = (x + y)(x+y')(x' + z)

a) Using truth tables

xyz	x+y	x+y'	x'+z	xz
000				
001			1	
010			1	
011				
100		1		
101		1		1
110	1			
111	1			1

b) Using Boolean identities

(x+y')(x'+z)(x+y)=xz since 1x cancels x' and y cancels y'.

13. Use any method to prove the following either True for False.

xz + x'y' + y'z' = xz + y'

This is false, the correct answer should be y' since there is 1xz for 1(xz').

16. Simplify the following functional expressions using Boolean algebra and its identities. List the identity used at each step.

a) z(w + x)' + w'xz + wxyz' + wx'yz'

1. rewrite as zw'+zx'+w'xz+wxyz'+wx'yz'
2. then place in order as w'z+x'z+w'xz+wxyz'+wx'yz'
3. w cancelations: z+x'z+xz+xyz'+x'yz'
4. x cancelations: z+z+z+yz'+yz'
5. y cancelations: none.
6. z cancelations: z+y.

b) y'(x'z' + xz) + z(x + y)'

1. x'y'z'+xy'z+x'z+y'z
2. y'z'+y'z+x'z+y'z
3. none
4. y'+y'+x'z+y'z
7. 5. y'+x'z+y'z.

c) x(yz' + x)(y' + z)

1. x(yy'z+yzz'+xy'+xz)
2. zx+xy+xxy+xxz
3. x(y+z)

23. The truth table for a Boolean expression is shown below. Write the Boolean expression in sum-of-products form.

x	y	z	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

1. (xyz)'+y(xz)'+xzy'+xyz'+xyz=(xyz') by cancelations.

27. Given the function: F(x,y,z)= y(x'z + xz') + x(yz + yz')

Lets first rewrite this so that it makes more sense.

x'yz+xyz'+xyz+xyz'. Now lets write in sum of products form.
a) List the truth table for F.

1. x|y|z|x'yz|xyz'|xyz

0 0 0

0 0 1

0 1 0

0 1 1 1

1 0 0

1 0 1

1 1 0 1

1 1 1 1

b) Draw the logic diagram using the original Boolean expression
c) Simplify the expression using Boolean algebra and identities.

(x+z)'+y
d) List the truth table for your answer in Part c.

It is the same table.
e) Draw the logic diagram for the simplified expression in Part c.

x

not------

z F

y ------
30. Draw a half adder using only NAND gates. For an extra point solve (31. Draw a full adder using only NAND gates).

A ---------- (A(AB)')' -----

--------- (AB)' --- ------ (A+B)' -----

B ---------- (B(AB)')' -----

A----------(A(AB)')'----

--------(AB)'--- -------- (A+B)'----------

B----------(B(AB)')'---- -------((A+B)C)'------(A+B+C)'------

C----------

-------((AB)'C(A+B))'

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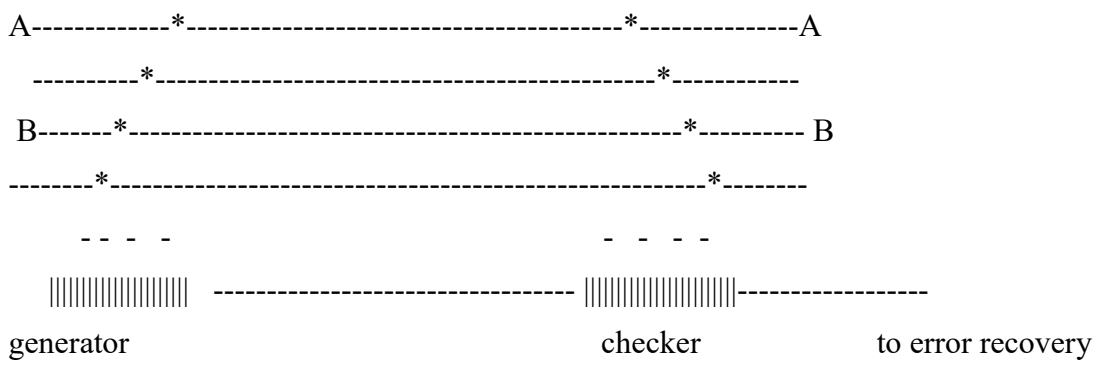
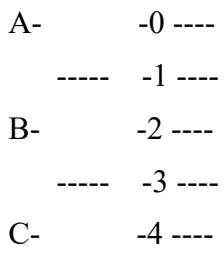
41. Draw circuits to implement the parity generator and parity checker shown in Tables 3.10

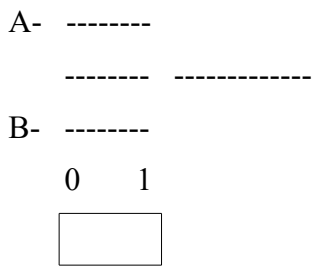
and 3.11, respectively.



46. Describe how each of the following circuits works and indicate typical inputs and outputs. Also provide a carefully
labeled "black box" diagram for each.
a) Decoder



b) Multiplexer



The area after the letters indicating input ports are the 'black box'

51. Complete the truth table for the following sequential circuit:

A	C	X	(x+acx)'
0	0	0	1
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

59. A Mux-Not flip-flop (MN flip-flop) behaves as follows: If M = 1, the flip-flop complements the current state. If M = 0
the next state of the flip-flop is equal to the value of N.
a) Derive the characteristic table for the flip-flop.

01---->10
b) Show how a JK flip-flop can be converted to a MN flip-flop by adding gate(s) and inverter(s). There is no such thing as an mn flip flop.
63. Construct two parity checkers using the Moore machine for one and Mealy machine for the other
65. Using the convolutional code and Viterbi algorithm described in this chapter, assuming that the encoder
and decoder always start in State 0, determine:
a) The output string generated for the input: 10010110.

abcdefgh>{adfg}? 10 01 01 10:2 1 1 2
b) In which state is the encoder after the sequence in (a) is read?

The encoder ends up in the null state; the encoder ends up in state 2.
c) Which bit is in error in the string, 11 01 10 11 11 11 10? What is the probable value of the string? 11 01 10 11 11 01 10 | 3 1 2 3 3 1 2

2a. x'y'z'+xy'z'+x'y'z+x'yz+x'yz' = 000+100+001+011+010

y'z'+z'+x'

b. x'y'z'+xy'z'+x'yz' = 000+100+010

z'+z'(y+x)'

c. x'y'z'+xy'z'+xyz+x'yz'+xyz' = 000+100+111+010+110

xyz'+z'

3. Create the Kmaps and then simplify for the following functions:
a) F(x,y,z) = x'y'z' + x'yz + x'yz'

Kmap sequence (xyz): 000 011 010
b) F(x,y,z) = x'y'z' + x'yz' + xy'z' + xyz'

000 010 100 110
c) F(x,y,z) = y'z' + y'z + xyz'

000 100 001 101 110

5a. (wxyz)'+(wxy)'z+(wxz)'y+ = (wx)'+(wxyz)'

(wyz)'x+(wy)'zx+(wz)'yx+ = w'x(y+z')

(xyz)'w+(xy)'wz+wyzx'+(xz)'wy = wx'

= (wx)'+w'x(y+z')+(wxyz)'

b. no more.

7. Create the Kmaps and then simplify for the following functions (leave in sum-of-products form):
a) F(w,x,y,z) = w'x'y'z + w'x'yz' + w'xy'z + w'xyz + w'xyz' + wxy'z + wxyz + wx'y'z

0001 0010 0101 0111 0110 1101 1111 1001

1. w'x'y'z+w'x'yz'+xy'z+xyz+xyz'+xyz+x'y'z

2. w'y'z+w'yz'+y'z+yz+yz'+xyz

3. w'z+w'z'+z+z+yz'+xyz

4. w'+w'+z+z

5.(z+w')

b) F(w,x,y,z) = w'x'y'z' + w'z + w'x'yz' + w'xy'z' + wx'y

0000 0001 0011 0101 0111 0010 0100 1010 1011

1. (wxyz)'+w'z+(wxz)'y+(yz)'x+x'y

2. (wx)'+w'+(wz)'+z'+x'

3. (w(x+z)+w+(x+z))'=w'

c) F(w,x,y,z) = w'x'y' + w'xz + wxz + wx'y'z

0001 0000 0111 0101 1111 1101 1001

1. y'+z+z+y'z

2. y'z+y'+z

12a. xyz

b. z+x+y'