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Assignment #3

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2. Construct a truth table for the following:

a) xyz + x(yz)' + x'(y+z) + (xyz)'
b) (x + y')(x' + z')(y' + z')

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

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

a) Using truth tables
b) Using Boolean identities

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

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

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

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

a) List the truth table for F.
b) Draw the logic diagram using the original Boolean expression
c) Simplify the expression using Boolean algebra and identities.
d) List the truth table for your answer in Part c.
e) Draw the logic diagram for the simplified expression in Part c.

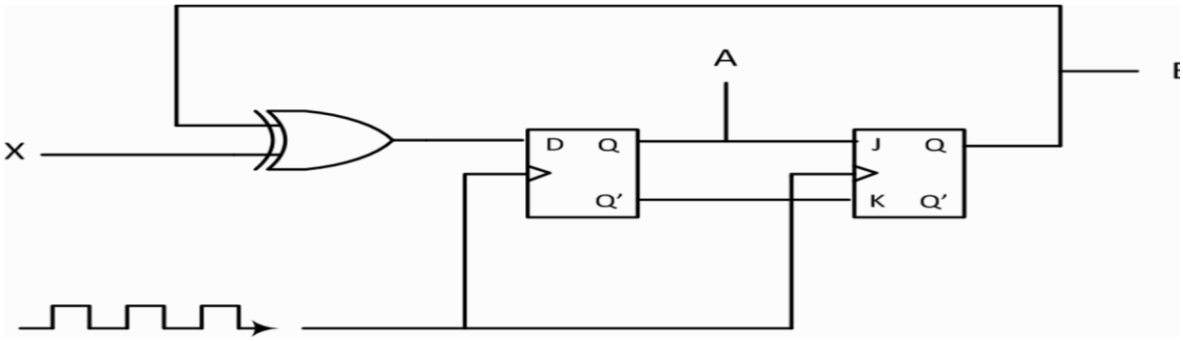
30. Draw a half adder using only NAND gates. For an extra point solve (31. Draw a full adder using only NAND gates).

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

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



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.
b) Show how a JK flip-flop can be converted to a MN flip-flop by adding gate(s) and inverter(s).

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.
b) In which state is the encoder after the sequence in (a) is read?
c) Which bit is in error in the string, 11 01 10 11 11 11 10? What is the probable value of the string?

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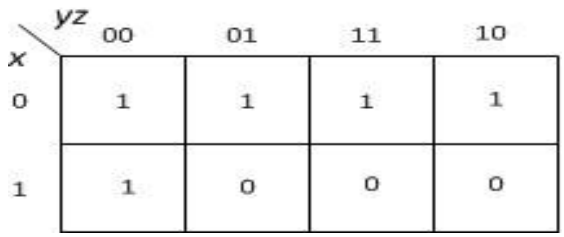
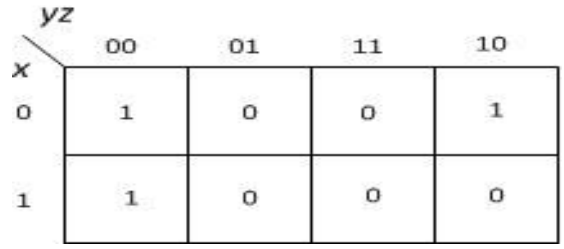
2. Write a simplified expression for the Boolean function defined by each of the following Kmaps.

a)



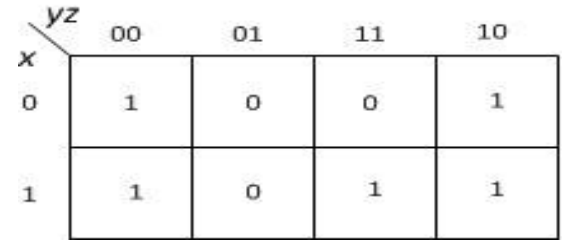
x \ yz	00	01	11	10
0	1	1	1	1
1	1	0	0	0

b)



x \ yz	00	01	11	10
0	1	0	0	1
1	1	0	0	0

c)



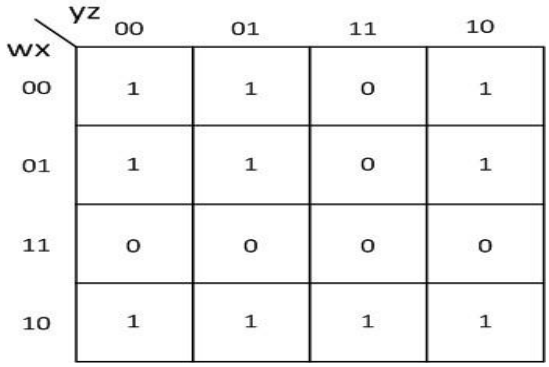
x \ yz	00	01	11	10
0	1	0	0	1
1	1	0	1	1

3. Create the Kmaps and then simplify for the following functions:

a) F(x,y,z) = x'y'z' + x'yz + x'yz'
b) F(x,y,z) = x'y'z' + x'yz' + xy'z' + xyz'
c) F(x,y,z) = y'z' + y'z + xyz'

5. Write a simplified expression for the Boolean function defined by each of the following Kmaps.

a)



wx \ yz	00	01	11	10
00	1	1	0	1
01	1	1	0	1
11	0	0	0	0
10	1	1	1	1

b)

wx \ yz	00	01	11	10
00	0	1	1	0
01	1	1	1	1
11	0	0	1	1
10	0	1	1	0

c)

wx \ yz	00	01	11	10
00	0	1	0	0
01	1	1	1	1
11	1	1	1	1
10	0	1	0	1

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

12. Find the minimized Boolean expression for the functions defined by the truth tables provided below.

a.

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

b.

w	x	y	z	F
0	0	0	0	0
0	0	0	1	1
0	0	1	0	0
0	0	1	1	0
0	1	0	0	X
0	1	0	1	0
0	1	1	0	X
0	1	1	1	0
1	0	0	0	1
1	0	0	1	X
1	0	1	0	X
1	0	1	1	X
1	1	0	0	X
1	1	0	1	1
1	1	1	0	X
1	1	1	1	X