CALIFORNIA STATE UNIVERSITY
FULLERTON™

EGEC 180 – Digital Logic and Computer Structures

Spring 2024

Lecture 7: Extra Example

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Example Problem #1

- Lets evaluate XY+Z

X	Y	Z	XY	XY+Z
0	0	0	0.0 = 0	0+0 = 0
0	0	1	0.0 = 0	0+1 = 1
0	1	0	0.1 = 0	0+0 = 0
0	1	1	0.1 = 0	0+1 = 1
1	0	0	1.0 = 0	0+0 = 0
1	0	1	1.0 = 0	0+1 = 1
1	1	0	1.1 = 1	1+0 = 1
1	1	1	1.1 =1	1+1 = 1

Practice Problem #1

- Lets evaluate X+YZ'

X	Y	Z	Z'	YZ'	X+YZ'
0	0	0	1	0.1 = 0	0+0 = 0
0	0	1	0	0.0 = 0	0+0 = 0
0	1	0	1	1.1 = 1	0+1 = 1
0	1	1	0	1.0 = 0	0+0 = 0
1	0	0	1	0.1 = 0	1+0 = 1
1	0	1	0	0.0 = 0	1+0 = 1
1	1	0	1	1.1 = 1	1+1 = 1
1	1	1	0	1.0 = 0	1+0 = 1

Practice Problem #2

- Is XY+Z = X+YZ'

XY+Z		X+YZ'
0+0 = 0		0+0 = 0
0+1 = 1	⟺	0+0 = 0
0+0 = 0	⟺	0+1 = 1
0+1 = 1	⟺	0+0 = 0
0+0 = 0	⟺	1+0 = 1
0+1 = 1		1+0 = 1
1+0 = 1		1+1 = 1
1+1 = 1		1+0 = 1

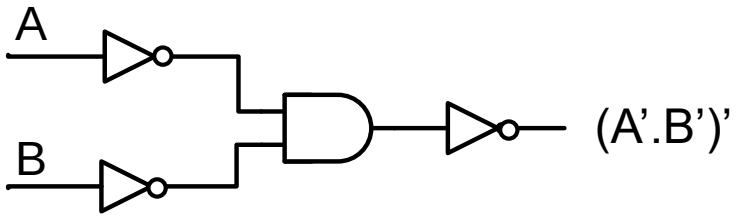
So the answer is NO

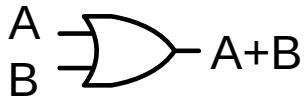
Example Problem #2

- Is A+B = (A'.B')'?
- Step 1 Complete the truth table for A+B
- Step 2 Evaluate the Truth Table for (A'.B')'

A	B	A'	B'	A'.B'	(A'.B')'
0	0	1	1	1.1 = 1	0
0	1	1	0	1.0 = 0	1
1	0	0	1	0.1 = 0	1
1	1	0	0	0.0 = 0	1

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1



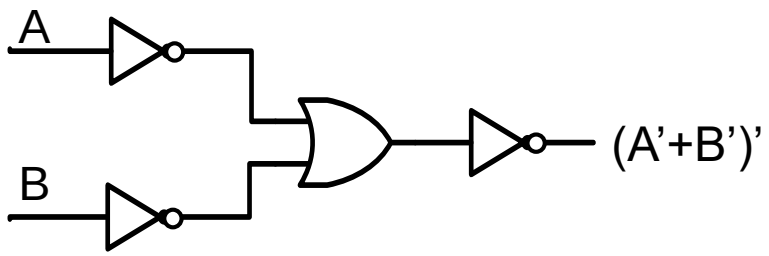


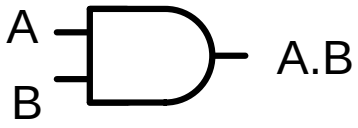
Practice Problem # 3

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

A	B	A'	B'	A'+B'	(A'+B')'
0	0	1	1	1+1 = 1	0
0	1	1	0	1+0 = 1	0
1	0	0	1	0+1 = 1	0
1	1	0	0	0+0 = 0	1

A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1





Practice Problem # 4

- What is the output for the function (X+X').Y

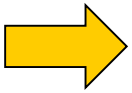
X	Y	X'	X+X'	(X+X').Y
0	0	1	0+1 = 1	1.0=0
0	1	1	0+1 = 1	1.1=1
1	0	0	1+0 = 1	1.0=0
1	1	0	1+0 = 1	1.1=1

Why implement the circuit It does not change Y?

Practice Problem #1

Given the following truth table write the truth function for F1?

A	B	C	F1
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0



	A	B	C	F1
A'B'C'	0	0	0	0
A'B'C	0	0	1	0
A'BC'	0	1	0	0
A'BC	0	1	1	0
AB'C'	1	0	0	1
AB'C	1	0	1	1
ABC'	1	1	0	1
ABC	1	1	1	0

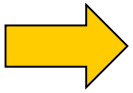
Truth Function

F1 = AB'C'+ AB'C+ ABC'

Practice Problem #2

Given the following truth table write the truth function for F2?

A	B	C	F2
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0



	A	B	C	F2
A'B'C'	0	0	0	1
A'B'C	0	0	1	1
A'BC'	0	1	0	1
A'BC	0	1	1	1
AB'C'	1	0	0	0
AB'C	1	0	1	0
ABC'	1	1	0	1
ABC	1	1	1	0

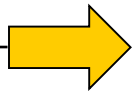
Truth Function

F2 = A'B'C'+ A'B'C + A'BC' + A'BC +ABC'

Practice Problem #3

Given the following truth table write the truth function for F1?

A	B	C	D	F3
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0



	A	B	C	D	F3
A'B'C'D'	0	0	0	0	1
A'B'C'D	0	0	0	1	1
A'B'CD'	0	0	1	0	1
A'B'CD	0	0	1	1	1
A'BC'D'	0	1	0	0	0
A'BC'D	0	1	0	1	0
A'BCD'	0	1	1	0	1
A'BCD	0	1	1	1	0
AB'C'D'	1	0	0	0	1
AB'C'D	1	0	0	1	1
AB'CD'	1	0	1	0	1
AB'CD	1	0	1	1	1
ABC'D'	1	1	0	0	0
ABC'D	1	1	0	1	0
ABCD'	1	1	1	0	1
ABCD	1	1	1	1	0

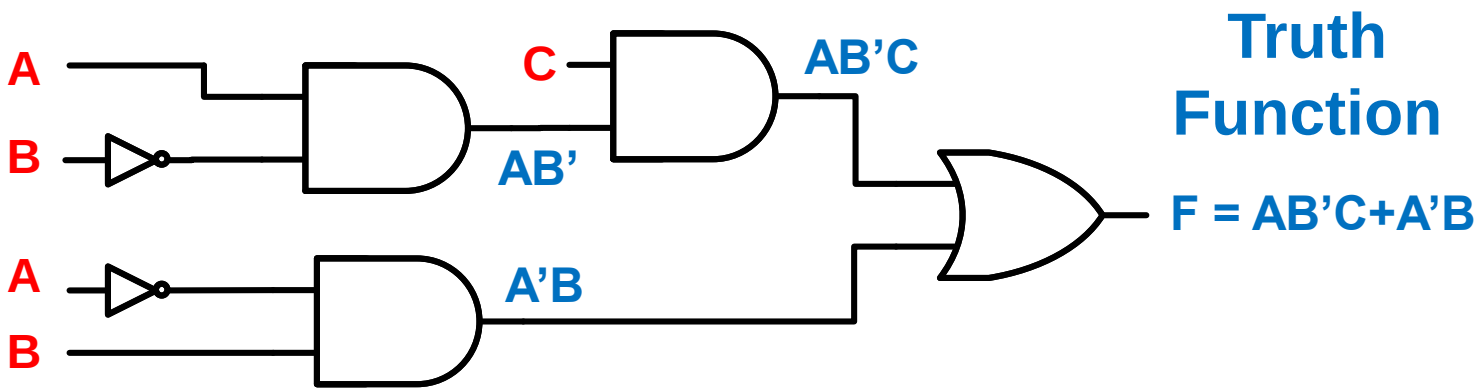
Truth Function

F3 = A'B'C'D' + A'B'C'D + A'B'CD' + A'B'CD + A'BCD' + AB'C'D + AB'CD' + ABCD'

Expressions/Boolean Functions

- A literal means we need to provide a wire to move the signal to the gate.
  - Each appearance of a variable or its complement in an expression will be referred to as a literal.
  - Thus, each literal in an expression corresponds to a gated input.

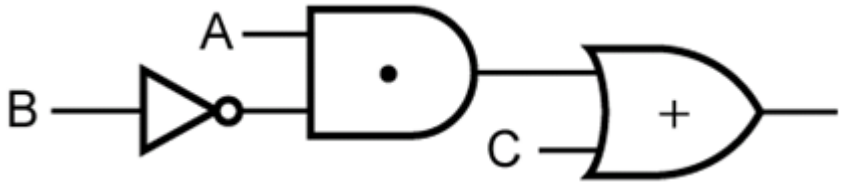
Gates are the Boolean operations



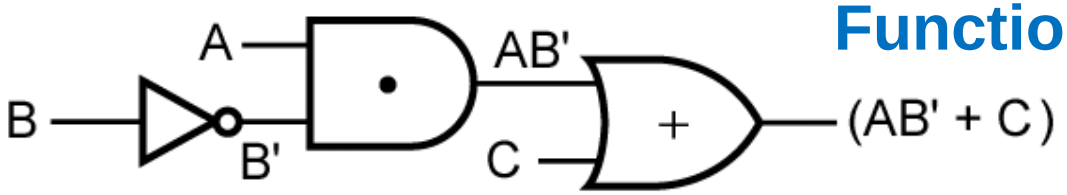
AB’C+A’B: 3 variables, 5 literals, 6 Gates

Practice Problem #4

What is this systems SOM Function and What is the number of variable, literals, and gates?



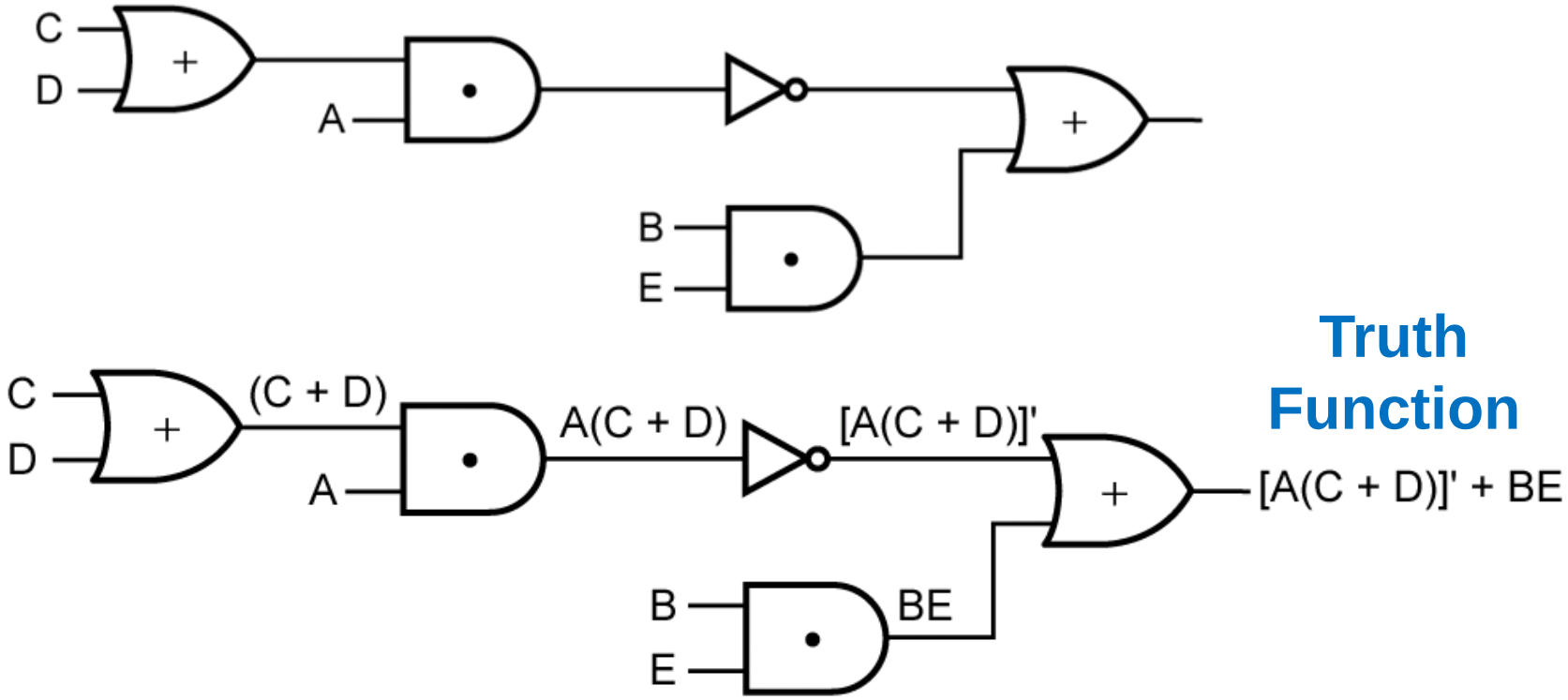
Truth Function



AB’+C: 3 variables, 3 literals, 3 Gates

Practice Problem #5

What is this systems SOM Function and What is the number of variable, literals, and gates?



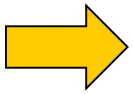
Truth Function

(A(C+D)'+BE: 5 variables, 5 literals, 5 Gates

Practice Problem #6

Given the following truth table Draw the Gate Logic?

A	B	C	F1
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0



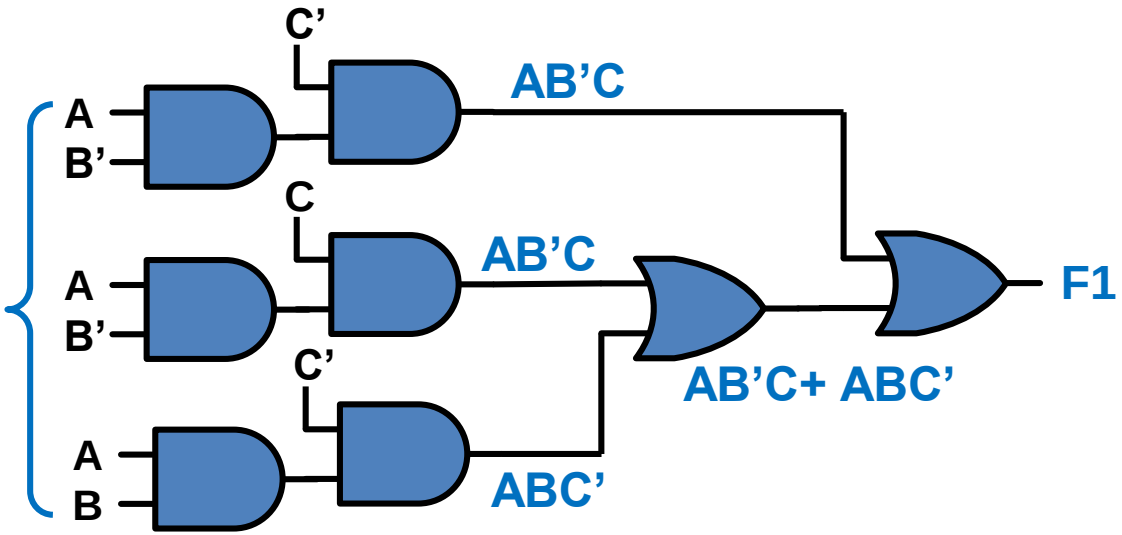
	A	B	C	F1
A'B'C'	0	0	0	0
A'B'C	0	0	1	0
A'BC'	0	1	0	0
A'BC	0	1	1	0
AB'C'	1	0	0	1
AB'C	1	0	1	1
ABC'	1	1	0	1
ABC	1	1	1	0

Truth Function

F1 = AB'C'+ AB'C+ ABC'

Truth Function

F1 = AB'C'+ AB'C+ ABC'



Practice Problem #7

Given the following truth table write the truth function for F2?

A	B	C	F2
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

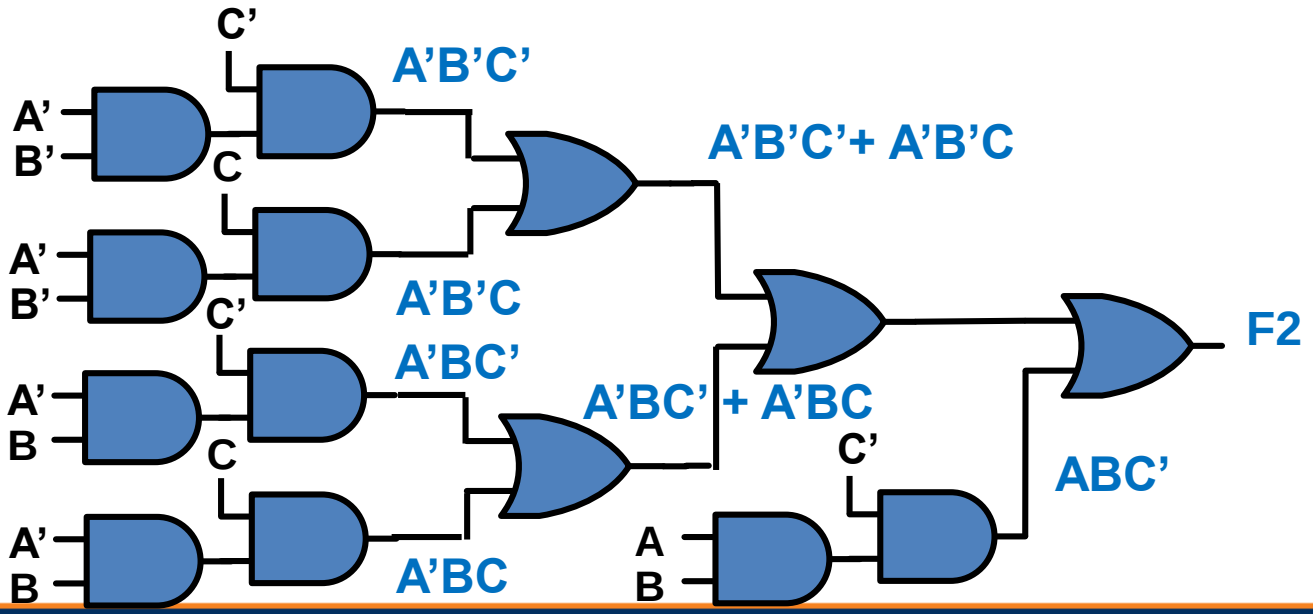
	A	B	C	F2
A'B'C'	0	0	0	1
A'B'C	0	0	1	1
A'BC'	0	1	0	1
A'BC	0	1	1	1
AB'C'	1	0	0	0
AB'C	1	0	1	0
ABC'	1	1	0	1
ABC	1	1	1	0

Truth Function

F2 = A'B'C'+ A'B'C
+ A'BC' + A'BC
+ ABC'

Truth Function

F2 = A'B'C'+ A'B'C
+ A'BC' + A'BC'
+ABC'



Q&A