

# ENEL 353 Tutorial T02

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Tue Oct 22 2019

## Exercise 1

Part a

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X		1	1
10			1	1

Part b

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X		1*	1
10			1	1

Rough work—  
find all the  
PI's

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X		1*	1
10			1	1

Answer

The only EPI  
is AC.

Part c. Best way to finish cover: Use 1 group of 2

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X		1	1
10			1	1

Unique minimal SOP expression:

$$AC + B\bar{C}\bar{D}$$

### Exercise 2

Part a.

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X			1
10			1	1

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Part b.

Rough work - find all PIs

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X			1
10			1	1

Answer

	AB			
CD	00	01	11	10
00		1	1	X
01	X	X		X
11	X			1
10			1	1

The only EPI is  $A\bar{D}$

Part c.

All minimal SOP expressions include the EPI  $A\bar{D}$ . We can't cover the remaining 1-cells with a single product, so we need two more products.

To cover cell 4 we can use  $B\bar{C}\bar{D}$  or  $\bar{A}B\bar{C}$

To cover cell 11 we can use  $A\bar{B}$  or  $\bar{B}D$ .

There are 4 minimal SOP expressions...

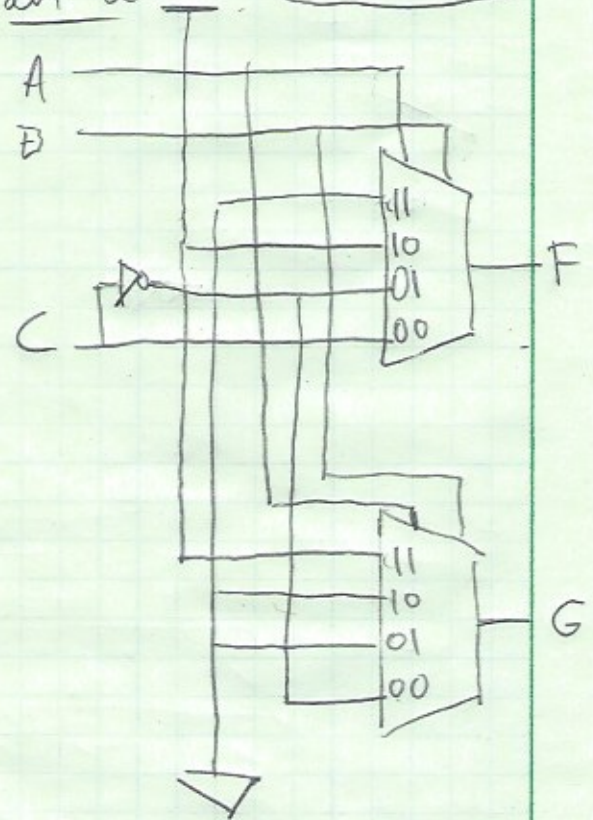
$$A\bar{D} + \left\{ \begin{array}{l} \text{one of} \\ B\bar{C}\bar{D} \\ \bar{A}B\bar{C} \end{array} \right\} + \left\{ \begin{array}{l} \text{one of} \\ A\bar{B} \\ \bar{B}D \end{array} \right\}$$

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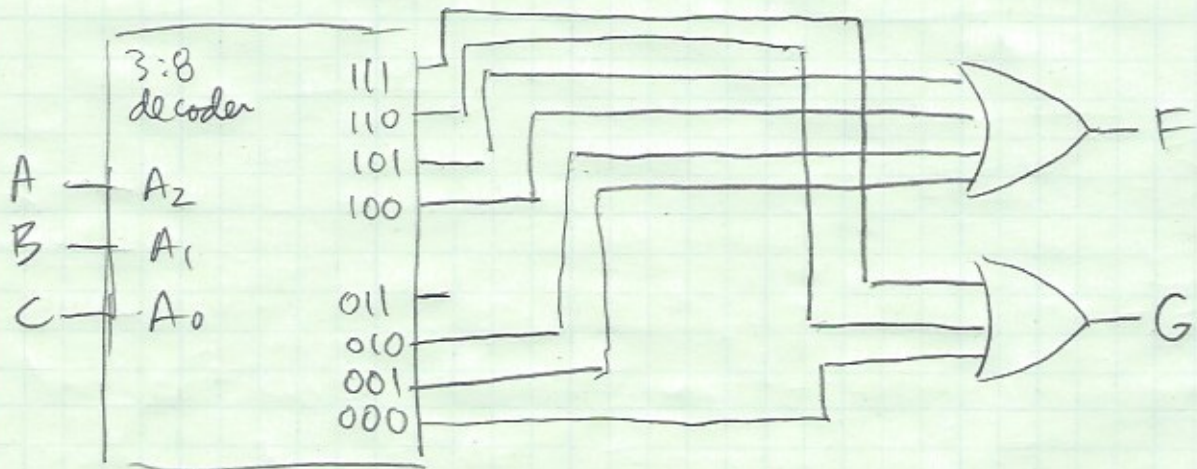
Exercise 3

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

Part a



Part b.



### Exercise 4

The number system is unspecified. Is it unsigned, two's complement, sign/magnitude or something else?

### Exercise 5

16-bit number is positive.

$$\begin{aligned}\text{Value is } & 1 \times 2^{13} + 1 \times 2^{10} + 1 \times 2^3 \\ & = 8192 + 1024 + 8 \\ & = 9224\end{aligned}$$

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8-bit number is negative

Find abs. value with two's-complement negation

$$\begin{array}{r} \text{Invert bits} \quad 00001000 \\ \text{Add } 1 \quad \quad \quad \quad \quad \quad \quad 1 \\ \hline \quad \quad \quad \quad \quad \quad \quad \quad 00001001 \end{array}$$

Abs value of number is +9. Number is -9.