

ECE 270 (Spring 2022)

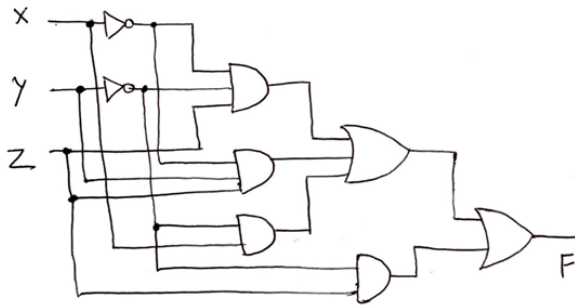
Homework 4

Due on 02/14/2022 (Monday) by 11:59 pm sharp on BrightSpace.

Note: Only legibly handwritten or typed submissions in PDF format are allowed.

You should work alone (no discussion)

1. Simplify the following circuit using switching algebra theorems and draw the resultant circuit:



2. Show that the following two functions are same by writing the canonical product for each one:
$$F1 = (X + Y) \cdot (Y' + Z) \cdot (X' + Z')$$
$$F2 = (X + Z) \cdot (X' + Y') \cdot (Y + Z')$$
3. If the canonical sum of an n-input logic function is itself a minimal sum, how many literals are in each product term of the minimal sum? Give an example of such a function.
4. Draw a K-Map for $F(X,Y,Z) = \sum (2,3,4,5)$. Write all the prime implicants and deduce the minimal sum of the logic function F.
5. Draw a K-map for $F(A,B,C,D) = \sum (0,1,2,6,7,8,9,10,14,15)$. Find all the *essential* prime implicants and the minimal sum of the logic function F.
6. Given a logic function $F(A,B,C,D) = \Pi (2,3,4,6,9,8,11,12,13)$, find all the prime implicants and *essential* prime implicants of F.
7. Draw a K-Map for $F(A, B, C, D, E) = \sum (0, 1, 2, 3, 8, 10, 12, 14, 16, 17, 18, 19, 20, 22, 28, 30)$. Write all the prime implicants and provide the minimal sum of logic function F.

8. Provide the minimal sum of the logic function that describes a four-input prime number detector (consider 1 is not a prime no.) using a K-Map.
9. Find the minimal product expression of F, given that $F(A,B,C,D) = \Pi (1,3,6,7,9,15,14)$.
10. Draw a K-Map for $F(A,B,C,D) = \sum (0,2,3,4,9,10,12,13) + \sum_d (6,8,14)$. Write all the prime implicants and provide the minimal sum of the logic function F.