P1 and P2 solutions

In General you are being asked to do the same thing. Evaluate and analyse a functional expression to determine if it is an optimal configuration of components to perform some task. Don’t worry about the question being contextualised into some domain related problem.

**Question 1:**

F = AD(D’ + AC) + C((A+C)’ + C)

F = ADD’ + ADAC + CC’A’ + CC

F = 0 + AADC + 0 + CC

F = ADC + C

F = C(AD +1)

F2 = C

**Truth Tables:**

*Before and After*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | D | C | D’ | AC | D’ + AC | AD | AD (D’+AC) | A+C | (A+C)’ | (A+C)’+C | C((A+C)’+C) | F |
| T | T | T | F | T | T | T | T | T | F | T | T | T |
| T | T | F | F | F | F | T | F | T | F | F | F | F |
| T | F | T | T | T | T | F | F | T | F | T | T | T |
| T | F | F | T | F | T | F | F | T | F | F | F | F |
| F | T | T | F | F | F | F | F | T | F | T | T | T |
| F | T | F | F | F | F | F | F | F | T | T | F | F |
| F | F | T | T | F | T | F | F | T | F | T | T | T |
| F | F | F | T | F | T | F | F | F | T | T | F | F |

**Question 2:**

We have to reduce this circuit down. What do you see when you look at the functional expression? Can you remember the Boolean identities? Where do you start?

*Note: not is being represented with the ~ sign. ~AB means that we have not A in an AND gate with B. ~(AB) means that we have A and B in an AND gate and then the resultant expression going through a NOT gate.*

F1 = X’Z + X’YZ’ +XZ

F1 = Z (X’ + X) + X’YZ’

F1 = Z(1) + X’YZ’ *: As x + x’ = 1*

F1 = Z + X’YZ’ *:As z(1) = z*

F1 =(Z + X’)(Z + Y)(Z + Z’)

F1 =(Z + X’)(Z + Y)

F2 =Z + X’Y Reduced circuit….

**Truth Tables:**

*Before*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | Y | Z | X’ | X’Z | XZ | Z’ | X’YZ’ | F1 |
| T | T | T | F | F | T | F | F | T |
| T | T | F | F | F | F | T | F | F |
| T | F | T | F | F | T | F | F | T |
| T | F | F | F | F | F | T | F | F |
| F | T | T | T | T | F | F | F | T |
| F | T | F | T | F | F | T | T | T |
| F | F | T | T | T | F | F | F | T |
| F | F | F | T | F | F | T | F | F |

*After*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | Y | Z | X’ | X’Y | F2 |
| T | T | T | F | F | T |
| T | T | F | F | F | F |
| T | F | T | F | F | T |
| T | F | F | F | F | F |
| F | T | T | T | T | T |
| F | T | F | T | T | T |
| F | F | T | T | F | T |
| F | F | F | T | F | F |