## COLLEGE OF Engineering – department of computer science

Circuits

Submit by the end of the class in groups of 3 (maximum).

*All labs that look similar won’t be considered.*

Name1: Walaa Mohammed Oudah S19105649

Name 2: Razan Almahdi S20106649

Name 3: Jumana Bangash S20106621

Task 1:

Given the Boolean function, F(x, y, z) = x′y + xyz′

1. Find F’, the complement of F. Remember that De Morgan’s law is very useful here.

(x’y + xyz’)’=

(xy’ + x’y’z)=

(x+y’) (x’+y’+z)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | y | z | X’ | Z’ | X’y | Xyz’ | F | F’ |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |

1. Show that FF′= 0 using the boolean identities. You will have to start by replacing F and F’ by their expressions found in a)

F(x,y,z)= x’y + xyz’

F’(x,y,z) = (x+y’)(x’+y’+z)

FF’= (x’y+xyz’) ((x+y’)(x’+y’+z))

= x’xy y’ (z’) (z) distributive law

= x’x = 0 inverse law

Yy’= 0 inverse law

Z’z= 0 inverse law

FF’= 0

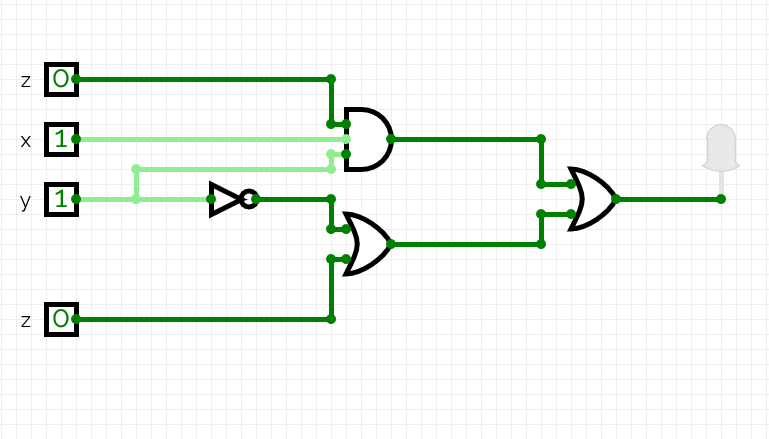
Task 2:

1. Find the truth table of F = xyz +(y’ + z)

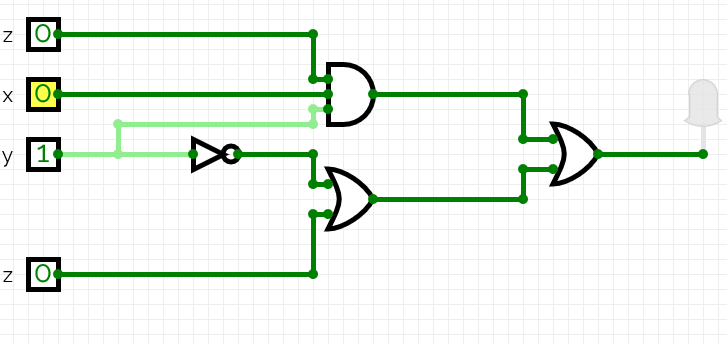
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **X** | **Y** | **Z** | **Y’** | **XYZ** | **Y’+Z** | **XYZ+ (Y’+Z)** |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 |

b) Draw the combinational circuit that directly implements the Boolean expression:

F= xyz + (y′ + z) using the following simulator => <https://circuitverse.org/simulator>



c) By testing the circuit make sure your truth table in a is correct (by testing we mean clicking on your inputs to test different values while observing the value of the output and comparing it to your truth table)

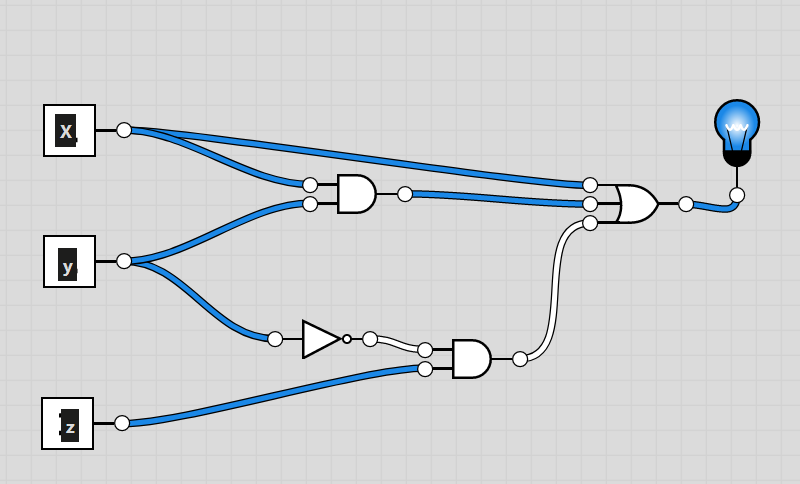


*You can attach the images of the circuits by downloading them directly from circuitverse*

Task 3:

a) Draw the combinational circuit that directly implements the following Boolean expression using the simulator:

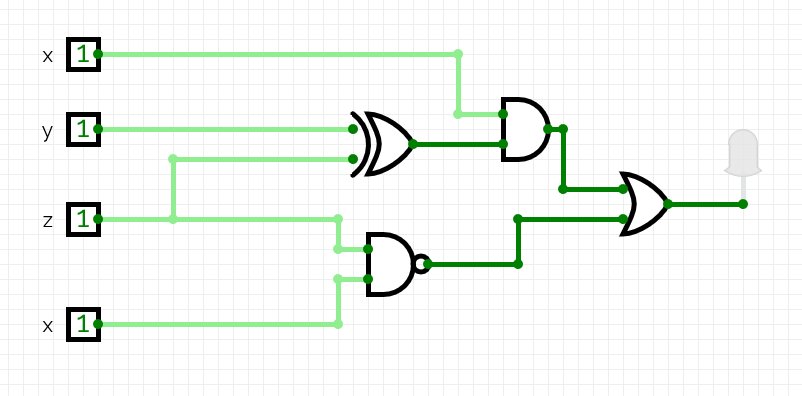
F(x, y, z) = x + xy + y′z



Task 4:

a) Draw the combinational circuit that directly implements the Boolean expression using the simulator:

F(x, y, z) = (x(yXORz)) + (xz)′



Task 5:

Give the boolean expression of the below circuit.

((xy)+ (yz)’)’

