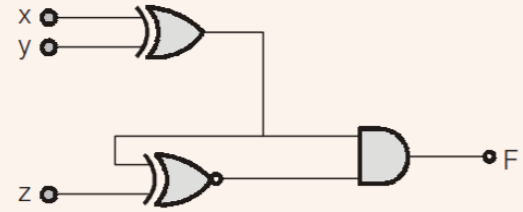
Assignment9

Abhay Suresh

4th January 2021

1 Assigned Question

The value of F is



(a) $X\bar{Y}Z + \bar{X}YZ$

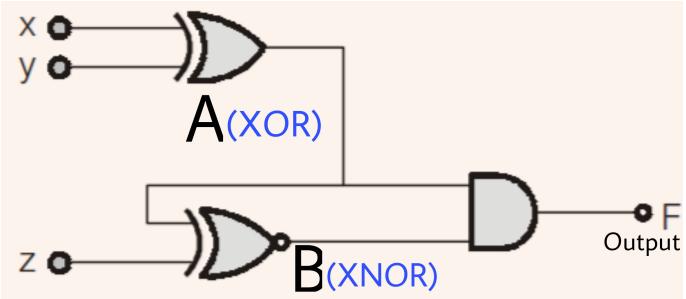
(b) $\bar{X}\bar{Y}Z + \bar{X}Y\bar{Z}$

(c) $\bar{X}\bar{Y}\bar{Z} + XYZ$

(d) $X\bar{Y}\bar{Z} + \bar{X}Y\bar{Z}$

2 Solution - Forming the Boolean Equation

From the Given logic gate we can identify three different logic gates XOR, XNOR and AND gate using X,Y,Z as variables and F as the output.
Let us represent these Logic gates as A and B, as shown in the following figure.



The Output from A (XOR), where X and Y are the inputs, can be written as
$A = (\bar{X}Y + X\bar{Y})$

Similarly the output from B (XNOR),where A and Z are the inputs can be written as
$B = (AZ + \bar{A}\bar{Z})$

Now A and B are the inputs for the required Output F which is
$F = (AB)$

From the previously obtained Boolean equations for A and B,
$F = [(\bar{X}Y + X\bar{Y})((\bar{X}Y + X\bar{Y})Z + \overline{(\bar{X}Y + X\bar{Y})}\bar{Z})]$

3 Truth Values of the Boolean Equation

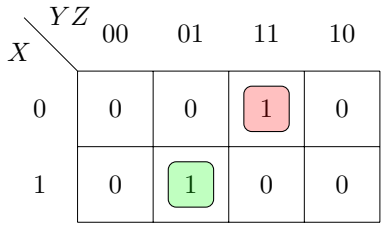
The obtained Boolean equation can be simplified further using a K-Map using the Truth Table of the Boolean Equation.

The Truth table values of the boolean equation has been found using a C code for the boolean equation which is mentioned in Section 5

Input			XOR Output	XNOR Output	Final Output
X	Y	Z	A	B	F = A.B
0	0	0	0	1	0
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	1	0	0
0	1	1	1	1	1
1	0	1	1	1	1
1	1	0	0	1	0
1	1	1	0	0	0

4 Simplified Equation using K-Map

From the Truth table obtained for the Logic Gates we can Simplify the respective Boolean Equation using K-Map,using the variables X,Y,Z.



The above obtained K-Map gives two terms in SOP as $F = (\bar{X}YZ + X\bar{Y}Z)$ which is option (a).

5 C Code used to obtain the Truth Table in Section 3 and Verify the Final Boolean Equation

```
//This C program is used to verify the obtained boolean eq(unsimplified) of the logic gate from Assignment 9 and to derive its Truth Values(EC2014,14)

#include <stdio.h>

//The  main function
int main(void)
{
unsigned char  X=0x01,Y=0x01,Z=0x00;//inputs in hex
unsigned char one = 0x01;//used for displaying the output in bit
unsigned char A,B,F;//outputs

            A = ((~X)&Y)|((~Y)&X);
            //XOR GATE

            B = (A&Z)|((~A)&(~Z));
            //XNOR GATE

            F = A&B;
            //Final output F (AND GATE)

printf("The following is the Input for the Logic gate for the Assignment 9,represented using X,Y,Z\n\n");
printf("X = %x  Y = %x  Z = %x",one&X,one&Y,one&Z);//Intput XYZ
printf(" \n");
printf("\n The output of the logic gate, ");
printf("F = %x\n" ,one&F);//Output F
printf("  \n");
printf("Similarly,rest of the values of input XYZ has been pre verified using this C program");
return 0;
}
```