

EE5803 - FPGA LAB

Assignment-2

Venkatesh Parvathala
EE22RESCH01005

February 3, 2022

Q. Verify the result obtained in Assignment-1 using Arduino. Given problem is

$$F(X, Y, Z, W) = \sum(0, 1, 2, 3, 4, 5, 10, 11, 14) \quad (1)$$

Sol. The given boolean expression can be expressed in K-Map as follows,

XY \ ZW				
	00	01	11	10
00	1	1	1	1
01	1	1	0	0
11	0	0	0	1
10	0	0	1	1

The implicants in 0,1,4,5 gives us $\bar{X}\bar{Z}$

The implicants in 2,3,10,11 gives us $\bar{Y}Z$

The implicants in 10,14 gives us $XZ\bar{W}$

Combining all the above terms will give us

$$F(X, Y, Z, W) = \bar{X}\bar{Z} + \bar{Y}Z + XZ\bar{W} \quad (2)$$

The above boolean expression which is same as obtained in Assignment-1 is verified using the following code in Arduino.

The corresponding code to be flashed into Arduino is as follows,

```
#include <Arduino.h>

# define X 2
# define Y 3
# define Z 4
# define W 5

int x, y, z, w, out;

void setup() {
  pinMode(LED_BUILTIN,OUTPUT);
  pinMode(X, INPUT);
  pinMode(Y, INPUT);
  pinMode(Z, INPUT);
  pinMode(W, INPUT);
  // put your setup code here, to run once:
}

void loop() {
  x = digitalRead(X);
  y = digitalRead(Y);
  z = digitalRead(Z);
  w = digitalRead(W);

  out = ((!x)&&(!z)) | ((!y)&&(z)) | ((x)&&(z)&&(!w));
  if (out==1)
    digitalWrite(LED_BUILTIN, HIGH);
  else
    digitalWrite(LED_BUILTIN, LOW);
}
```

The above code can be found in Git with the name Assignment_2.cpp and the same is verified by flashing into the Arduino.