

KARNAUGH MAP(ASM)

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Abstract

This document shows the truth table and logic diagram of given boolean function by using KMap.

1 Components

| Component | Value | Quantity |
|--------------|--------|----------|
| Arduino | UNO | 1 |
| Resistor | 220ohm | 1 |
| Bread board | - | 1 |
| Jumper wires | M-M | 20 |
| Led | - | 1 |

2 Logic

The circuit takes 4-bit number from (0-7) as input W,X,Y,Z and produces the F as output according to the logic given in table 1.

| W | X | Y | Z | F(W,X,Y,Z) |
|---|---|---|---|------------|
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 1 |
| 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 | 1 |

Table 1:

3 Kmap

Using the boolean logic output F can be expressed in terms of the inputs W,X,Y,Z with the help of the following Kmap.

| | | | | | |
|----|----|----|----|----|----|
| | | YZ | | | |
| | | 00 | 01 | 11 | 10 |
| WX | 00 | 0 | 1 | 0 | 0 |
| | 01 | 0 | 1 | 1 | 1 |
| | 11 | 0 | 1 | 1 | 1 |
| | 10 | 0 | 1 | 1 | 1 |

The boolean expression for the output F is obtained in the form of POS after minimizing the Kmap maxterm implicants.

$$F=XY'Z+X'Y'Z+W'XY+WX'Y+WX'Y$$

4 Hardware Connection

| Arduino | 6 | 7 | 8 | 9 | 5 | GND |
|------------|-----|-----|-----|-----|-----|-----|
| breadboard | 0/1 | 0/1 | 0/1 | - | - | |
| led | - | - | - | +ve | -ve | |

Table 2:

Give the connections as per Table 2. For taking the inputs connect 5V of arduino to +ve line of bread board to consider it as logic 'HIGH'.connect GND pin of arduino to -ve line of bread board to consider it as logic 'LOW'.

For example if the inputs W,X,Y,Z are connected 1,0,1,1 respectively the output should be 1 i.e., the LED connected to the 5th pin should glow.

In the another case if we connect the inputs W,X,Y,Z to 1,1,0,0 respectively the output should be 0 i.e., the LED connected to 5th pin should turn off

The circuit implementation of the above function is given in figure 1.

5 Software

- 1.Connect the arduino to the USB port of computer
- 2.Download the follwing code

<https://github.com/Gowt-hami/fwc-1-module1/blob/main/assignment%202/hello.asm>

3. Upload the code into the arduino board.

4. The output '1' is represented as the state: 'LED ON'
and '0' is represented as the state 'LED OFF'

