FPGA ASSIGNMENT

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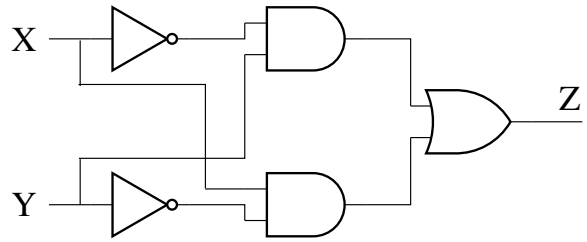
IITH - Future Wireless Communication

CONTENTS

I. QUESTION

In the circuit shown below, X and Y are digital inputs, and Z is a digital output. The equivalent circuit is a

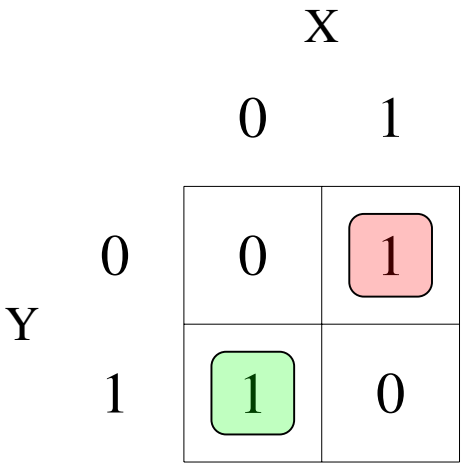


(A) NAND gate
(B) NOR gate
(C) XOR gate
(D) XNOR gate

II. ANSWER

The above question can be solved as $X \cdot \bar{Y} + \bar{X} \cdot Y$ .i.e equivalent circuit is XOR-circuit.

III. K-MAP IMPLEMENTATION



Therefore $Z = X \cdot \bar{Y} + \bar{X} \cdot Y$

IV. TRUTH TABLE

X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	0

Truth table for Boolean funtion Z

V. LOGIC DIAGRAM

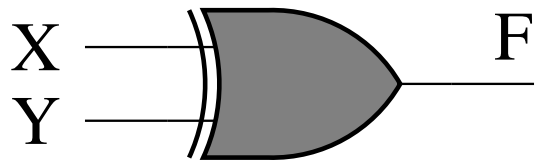


Fig. 2

VI. COMPONENTS

Components	Values	Quantity
VAMAN	FPGA	1
Jumper Wires	F-M	6
Breadboard		1
LED		1
Resistor	$\leq$ 220 Ohms	1

VII. IMPLEMENTATION

VAMAN PIN	INPUT	OUTPUT
21	X	
22	Y	
18		F

Connections

Procedure

1. Connect the circuit as per the above table.
2. Connect inputs to Vcc for Logic 1, ground for Logic 0.
3. Execute the circuit using the below codes.

https://github.com/koushikkalyani/FWC/blob/main/FPGA/helloworldfpa.v

4. Change the values of X, Y in the Hardware and verify the Truth Table.

How to execute

1. Write your code in helloworldfpga.v file.
2. Also update .pcf file for pin configuration.
3. To compile use the below command by changing directory appropriately.
   ql_symbiflow -compile -src /data/data/com.termux/files/home/fpga-examples/blink -d ql-eos-s3 -P PU64 -v helloworldfpga.v -t helloworldfpga -p quickfeather.pcf -dump binary.
4. Connect your mobile hotspot to laptop and send .bin file by using command.
   scp /data/data/com.termux/files/home/fpga-examples/blink/helloworldfpga.bin pi@192.168.0.114:
   change pi as your system name and IP address.
5. If you dont have Tinyfpga then type the following command.
   git clone –recursive https://github.com/QuickLogic-Corp/TinyFPGA-Programmer-Application.git
   sudo pip3 install tinyfpgab pyserial
   sudo reboot
6. Connect the Vaman to the Raspberry Pi through USB.
7. There is a button and an LED to the left of the USB port on the Vaman. There is another button to the right of teh LED.
8. Press the right button first and immediately press the left button. The LED will be blinking green. The Vaman is now in bootloader mode.
9. Then execute the following.
   python3 /home/pi/TinyFPGA-Programmer-Application/tinyfpga-programmer-gui.py –port /dev/ttyACM0 –appfpga /home/pi/helloworldfpga.bin –mode fpga –reset
   Suitably change pi as your system name.