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**CS-E1**

**DLD LAB**

**Final project:**

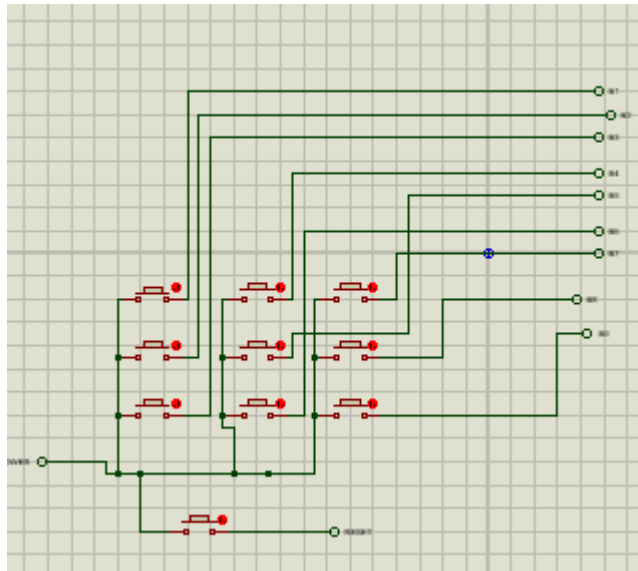
**TIC TAC TOE**

TIC TAC TOE is a game for two players, who take turns marking the spaces in a 3×3 grid. The player who succeeds in placing three of their marks in a horizontal, vertical, or diagonal row is the winner.

In this project we will be using push buttons for taking input from players and LEDs will be used to show the game and winner or draw if there is no winner.

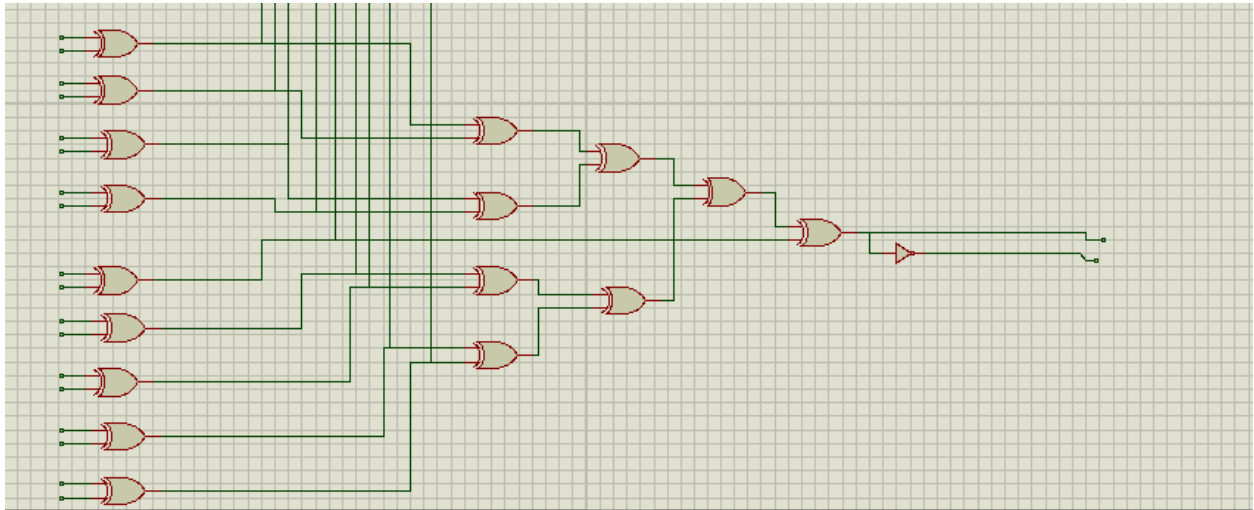
This game is a combination of different kinds of circuit, all those circuits are briefly described below:

## 1.Input Push Buttons:



Push button is basically used as a connector to pass the signal through the wire if it is open no power will pass through it, 9 switches/buttons will be used all having same connection.

## 2. XOR GATE COMBINATION:

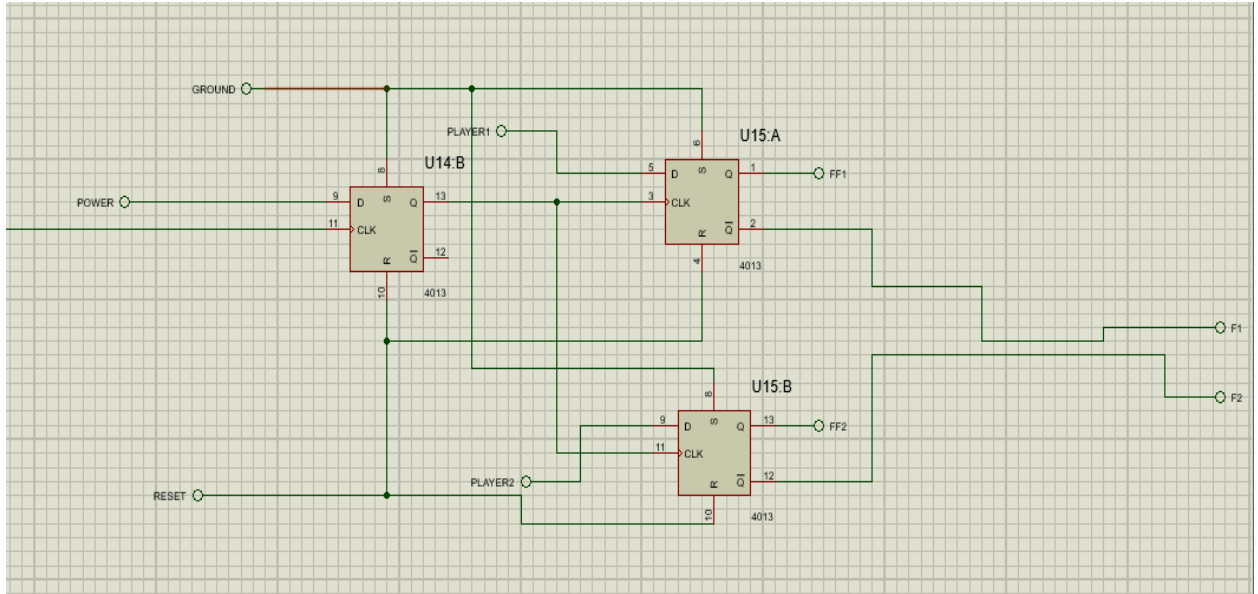


This combination of XOR gates is used to determine the input, like if the button is pressed by player 1 or player 2, as according to the truth table of XOR gate it gives 1 on alternate values.

| A | B | X |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

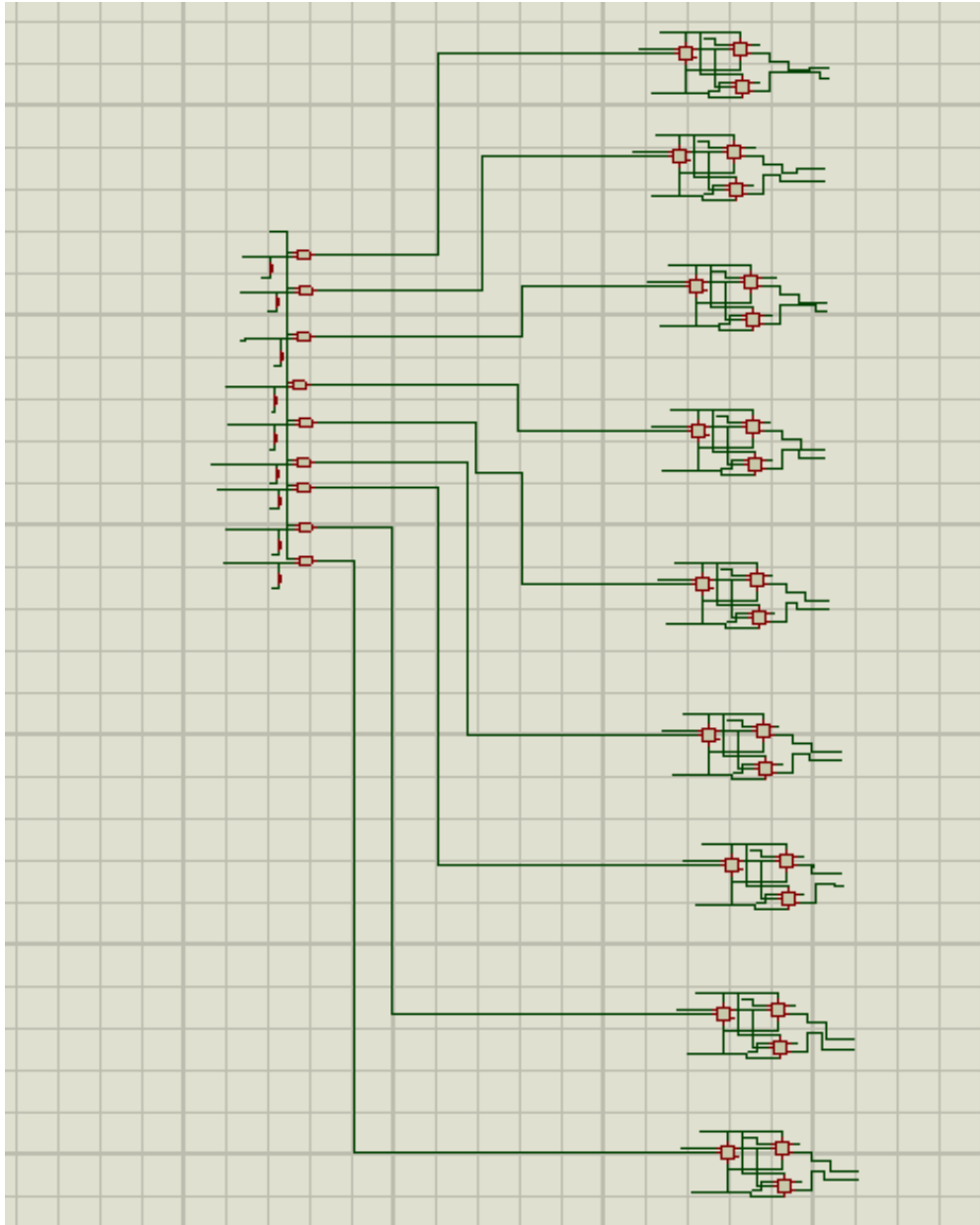
The output of these XOR gates will go to the D pin of flipflops we used to save our data.

### 3. FLIP-FLOP UNIT:



This is a one flip flop unit which gets data from push buttons and store it and save it from losing, left most flip flop is used to stop over pressing of button, it means that without this if player 1 pressed first button player 2 can again press that which will result in cheating.

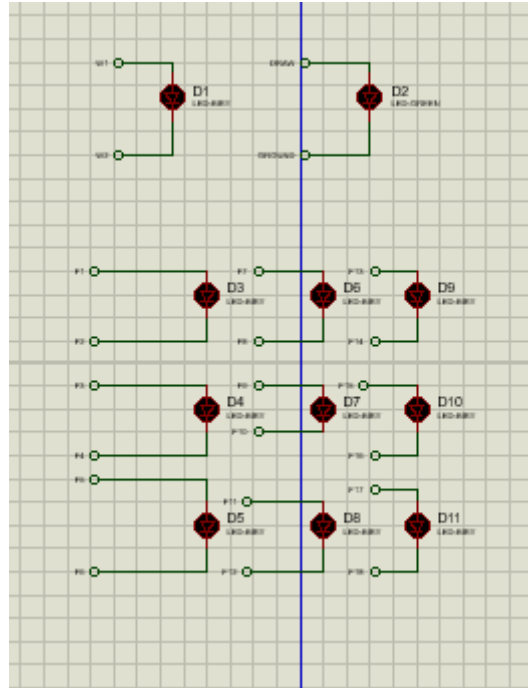
9 units of these flip flops are used in this project. Q output of these flip flops will go to XOR combination and Qnot will go to LEDs circuit which is used to show output. This Qnot will also go to the condition checking circuit.



#### **4. LED<sub>s</sub> CIRCUIT:**

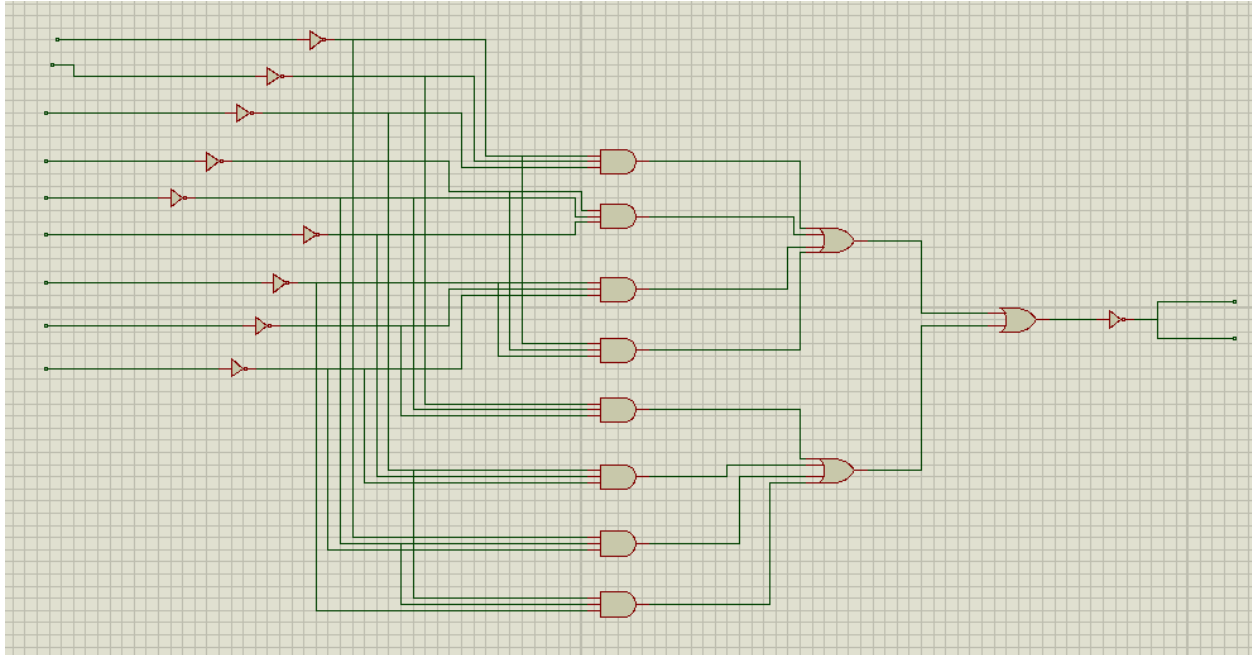
Bicolor LEDs are used to show the output and progress of game. These LEDs get input from the Qnot of 9 flip flop units, and XOR gives information to flip flops whether it is player 1 or

player 2. One winning LED is used above which turns on in case if any player won, besides this a green LED turns on if the game is drawn.



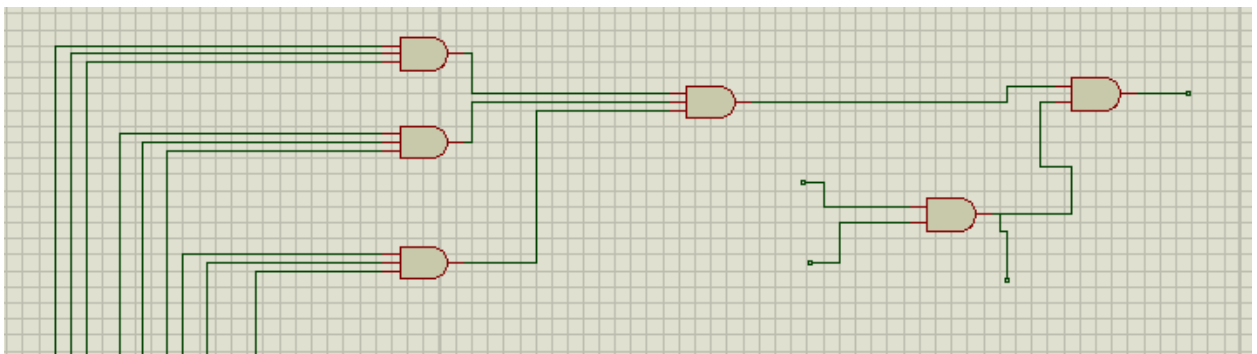
## 5. CONDITION CHECKING COMBINATION:

This combination of 3 input and gates receives the input from Qnot of flip flops and check the winning conditions. There are 8 different conditions which need to be checked so 8 three input AND gates are used, this circuit is same for both players but the inputs are different for example to check player 1 it gets odd number inputs and for player 2 it gets even number inputs from flip flops. The output of this combination goes to winning LED and Draw checking circuit.



## 6. DRAW CHECKING CIRCUIT:

This circuit attaches with the XOR combination. 3 three input AND gates are used which gives three outputs that goes into another 3 input AND gate, it goes to a two input AND gate whose other input comes from the outputs of condition checking circuit. Its output goes to the Draw LED so if game is draws that LED turns on.



\*Default terminal pins are used to avoid mixing and complex circuits\*