

## 24. FULL SUBTRACTOR

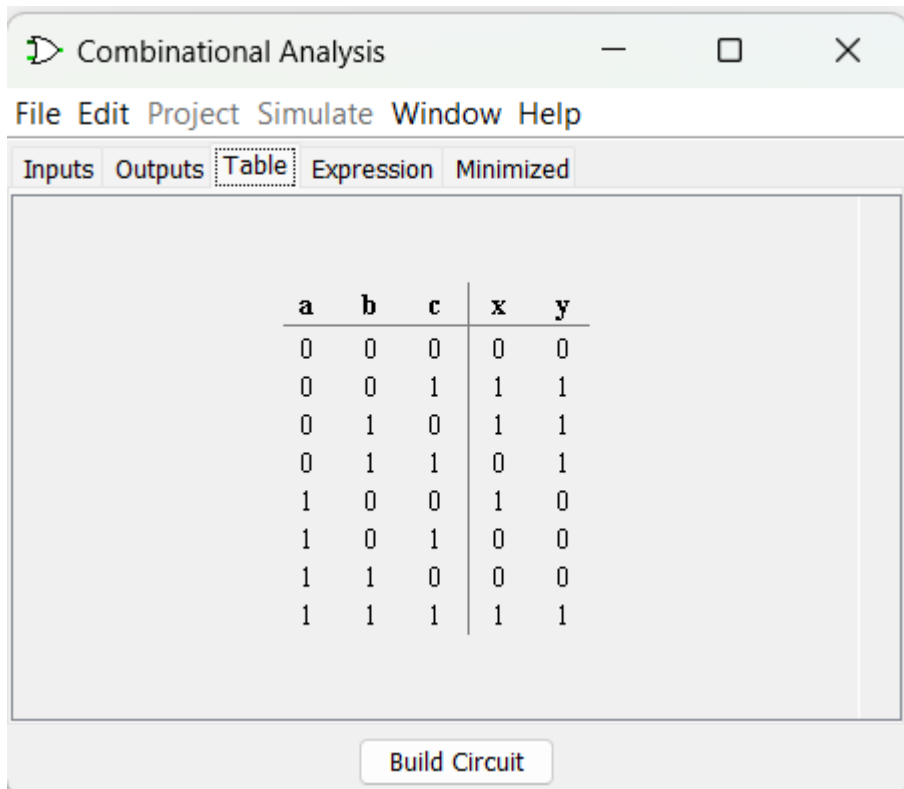
EXP.NO: 24

AIM: To design and implement the full subtractor using Logisim simulator.

PROCEDURE:

- 1) Pick and place the necessary gates.
- 2) Insert 3 inputs into the canvas.
- 3) Connect the inputs to the XOR gate, AND gate and OR gate.
- 4) Insert 2 outputs into the canvas.
- 5) Make the connections using the connecting wires.
- 6) Verify the truth table.

TRUTH TABLE:



The screenshot shows the 'Combinational Analysis' window in Logisim. The 'Table' tab is selected, displaying a truth table for a full subtractor. The table has three input columns (a, b, c) and two output columns (x, y). The inputs are listed in binary from 000 to 111. The outputs x and y represent the difference and borrow, respectively.

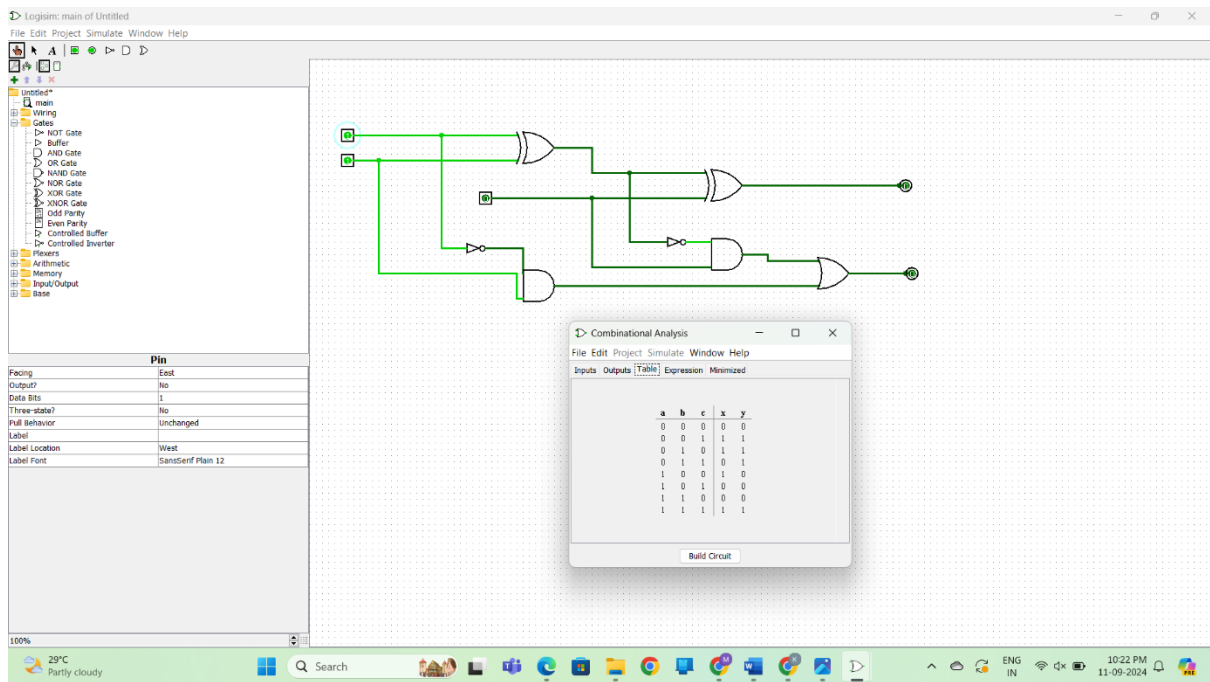
a	b	c	x	y
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

At the bottom of the window, there is a 'Build Circuit' button.

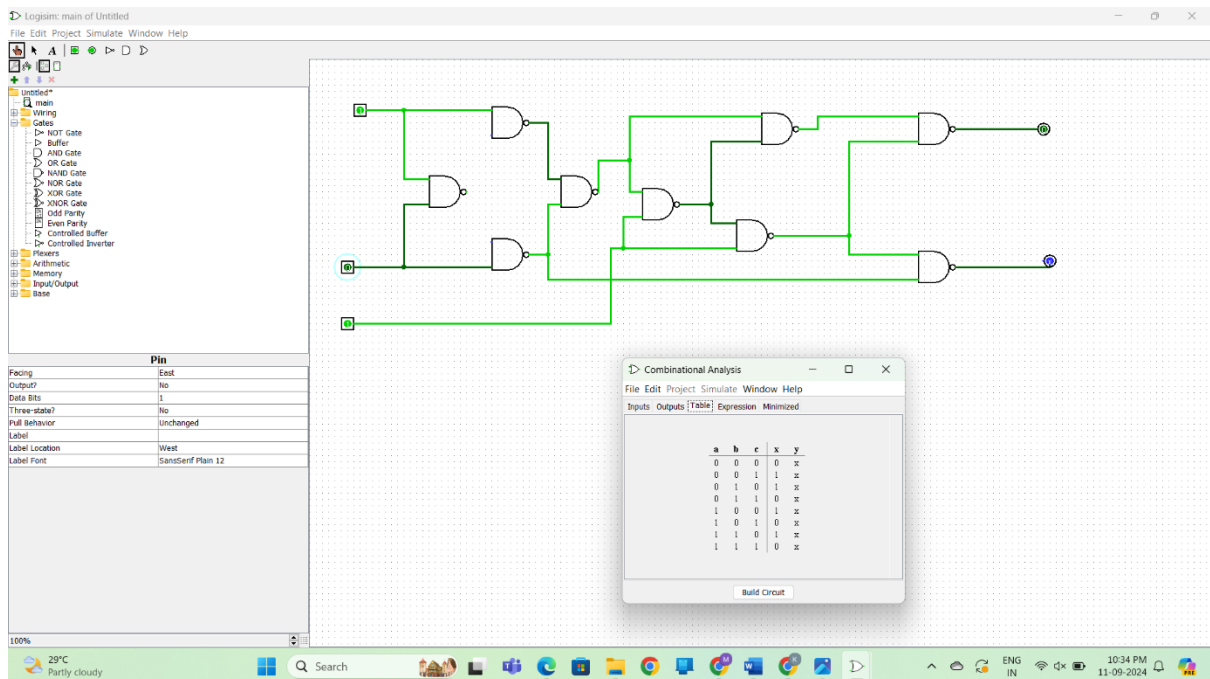
$\text{Diff} = (A \oplus B) \oplus \text{Borrowin}$ ;

$\text{Borrow} = A \cdot B + (A \oplus B) \cdot \text{Borrowin}$ ;

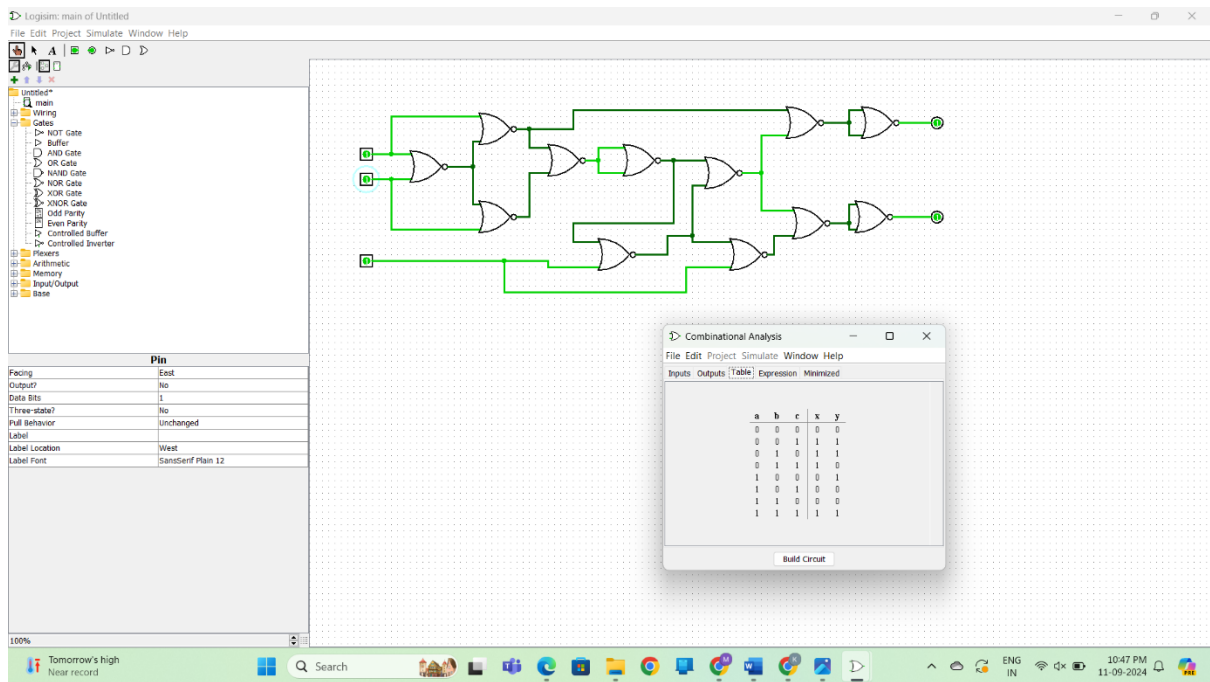
Logic Diagram:



## Full Subtractor using NAND Gates OUTPUT



## Full Subtractor using NOR Gates OUTPUT



RESULT: Thus full subtractor has been designed and implemented successfully using logisim simulator.