SAFETY BUZZER IN A CAR

(WITH THE HELP OF 3 FACTORS DOOR,SEAT BELT AND KEY)

THEORY/DESCRIPTION :

The following is a review of the design and operation of a combinational logic circuit using AOI logic. This design controls the safety buzzer in a car and is designed to the following specifications:

The buzzer is ON whenever the door is open OR the key is in the ignition AND the seat belt is NOT buckled.

TRUTH TABLE :

Car Buzzer – Truth Table			
Seat Belt	Key	Door	Buzzer
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Seat Belt
- 0 : Seat Belt is NOT Buckled
- 1 : Seat Belt is Buckled

Key
- 0 : Key is NOT in the Ignition
- 1 : Key is in the Ignition

Door
- 0 : Door is NOT Open
- 1 : Door is Open

Buzzer
- 0 : Buzzer is OFF
- 1 : Buzzer is ON

Now according to the truth table our logical equation for buzzer becames, (A= seat belt, B= key,c= door)

$$\overline{A}\,\overline{B}C+\overline{A}B\overline{C}+\overline{A}BC+A\overline{B}C+ABC$$

We will try to minimize it,

Start

$$\overline{A}\,\overline{B}C+\overline{A}B\overline{C}+\overline{A}BC+A\overline{B}C+ABC$$

Apply the Distributive Law: $AB+AC = AB+C$

$$\overline{A}C(\overline{B}+B)+\overline{A}B\overline{C}+A\overline{B}C+ABC$$

Apply the Complement Law: $A+\overline{A} = 1$

$$\overline{A}C1+\overline{A}B\overline{C}+A\overline{B}C+ABC$$

Apply the Identity Law: $A1 = A$

$$\overline{A}C+\overline{A}B\overline{C}+A\overline{B}C+ABC$$

Apply the Distributive Law: $AB+AC = AB+C$

$$\overline{A}(B\overline{C}+C)+A\overline{B}C+ABC$$

Apply the Distributive Law: $AB+AC = AB+C$

$\overline{A}(B+C)+AC(\overline{B}+B)$

Apply the Complement Law: $A+\overline{A} = 1$

$\overline{A}(B+C)+AC1$

Apply the Identity Law: $A1 = A$

$\overline{A}(B+C)+AC$

Apply: Distribution

$\overline{A}B+\overline{A}C+AC$

Apply the Distributive Law: $AB+AC = AB+C$

$\overline{A}B+C(\overline{A}+A)$

Apply the Complement Law: $A+\overline{A} = 1$

$\overline{A}B+C1$

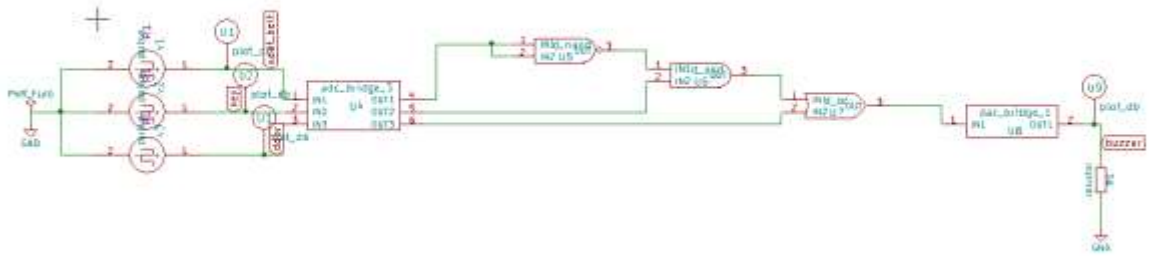
Apply the Identity Law: $A1 = A$

$\overline{A}B+C$

Hence ,

Buzzer= $\overline{\text{seat\_belt.key}}$ + door

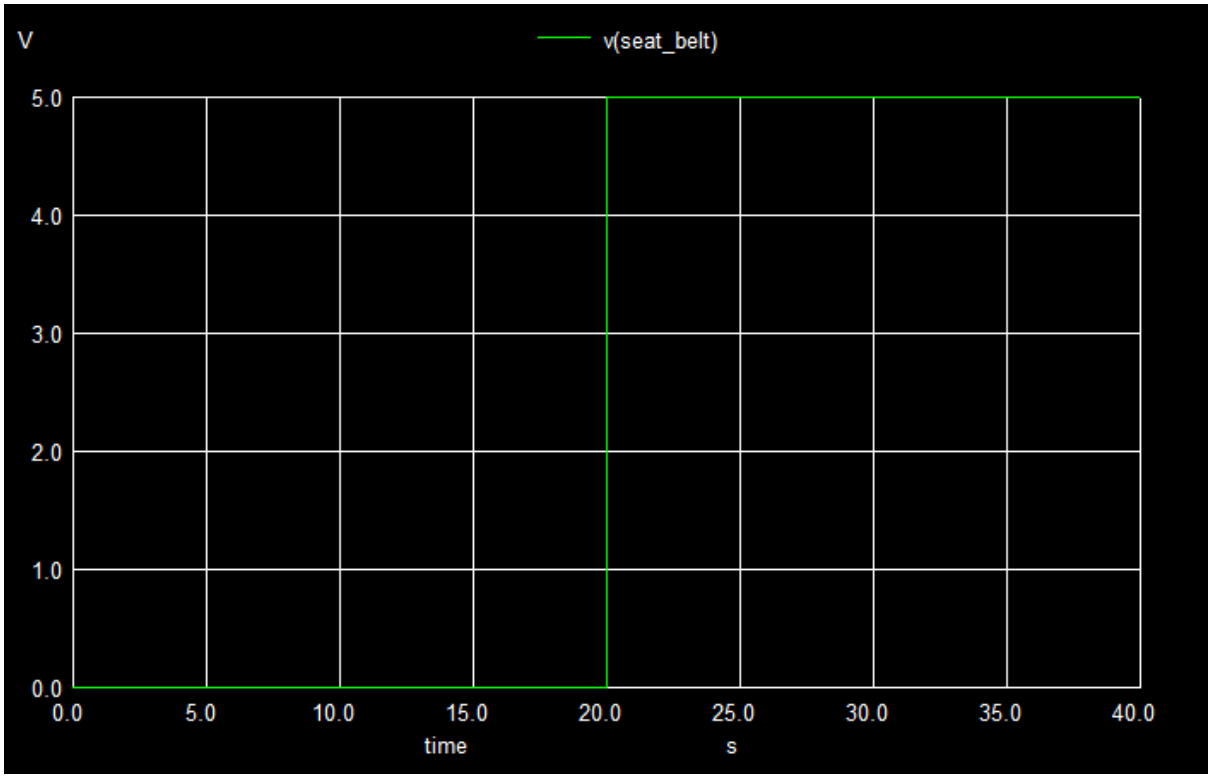
E-SIM CIRCUIT DIAGRAM WITH APPROPRIATE RESULT :



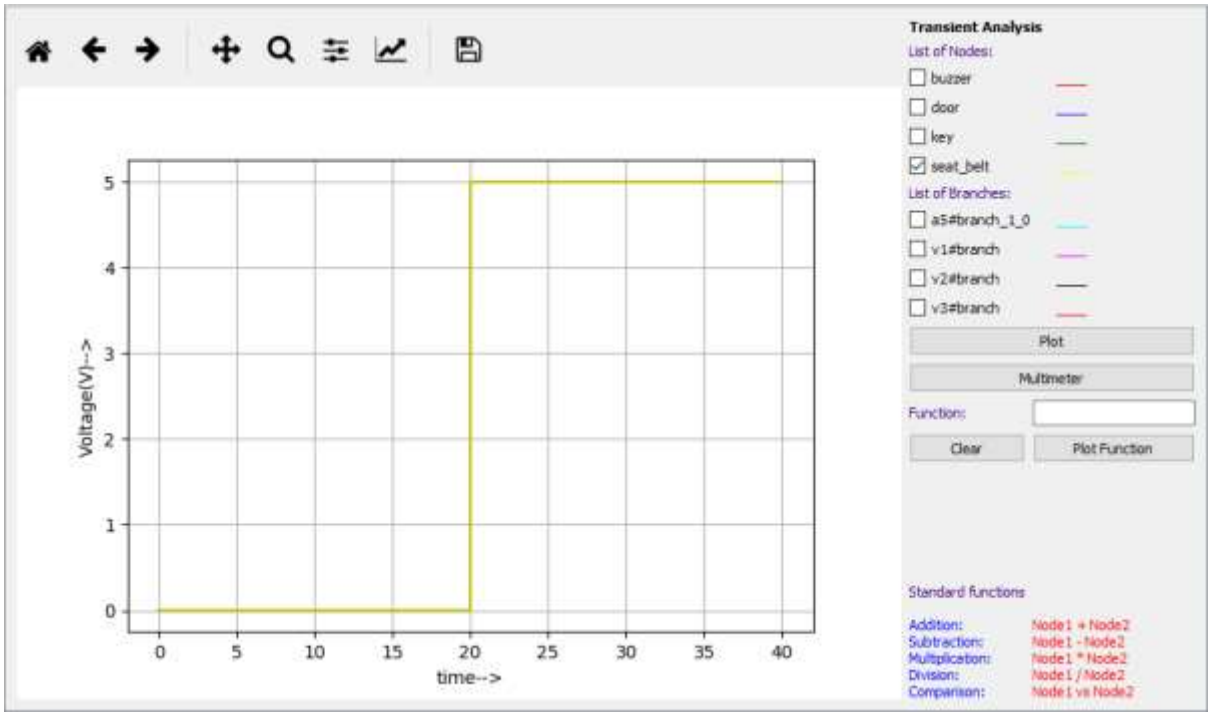
**instead of not gate nand is used as not.

1.for seat_belt

a.ngspice

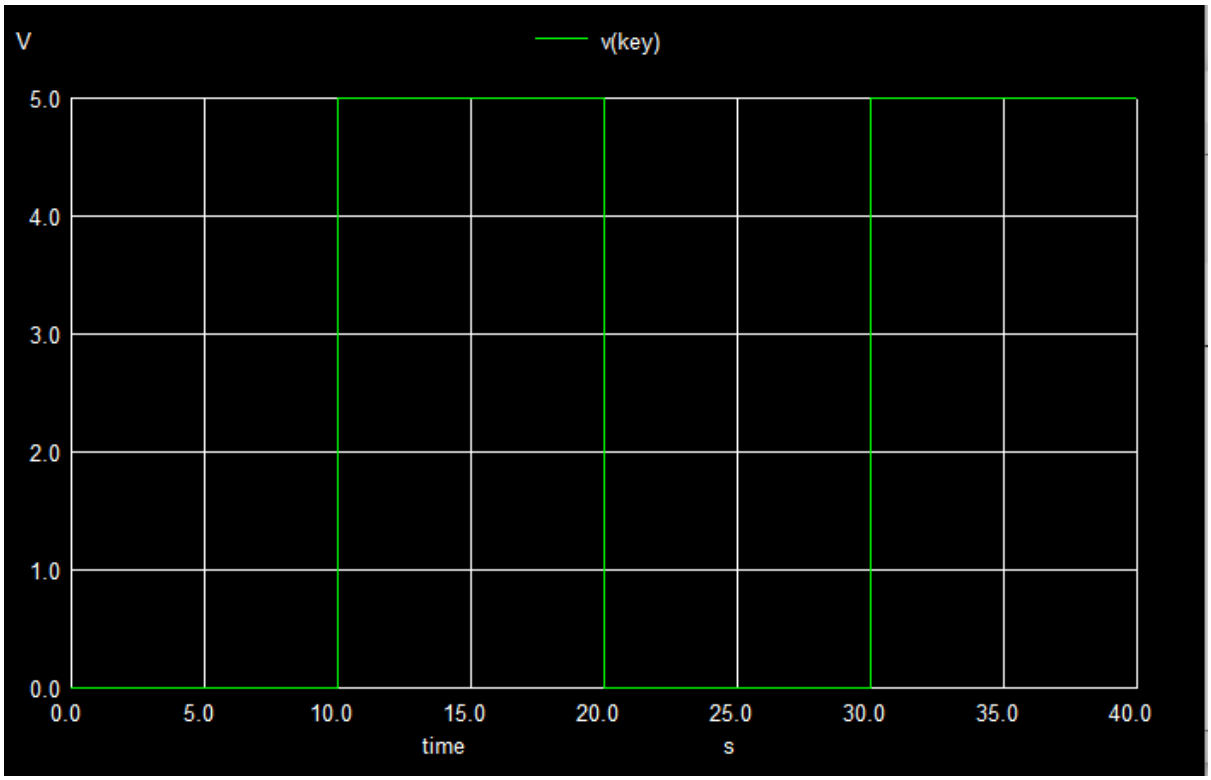


b.python plot

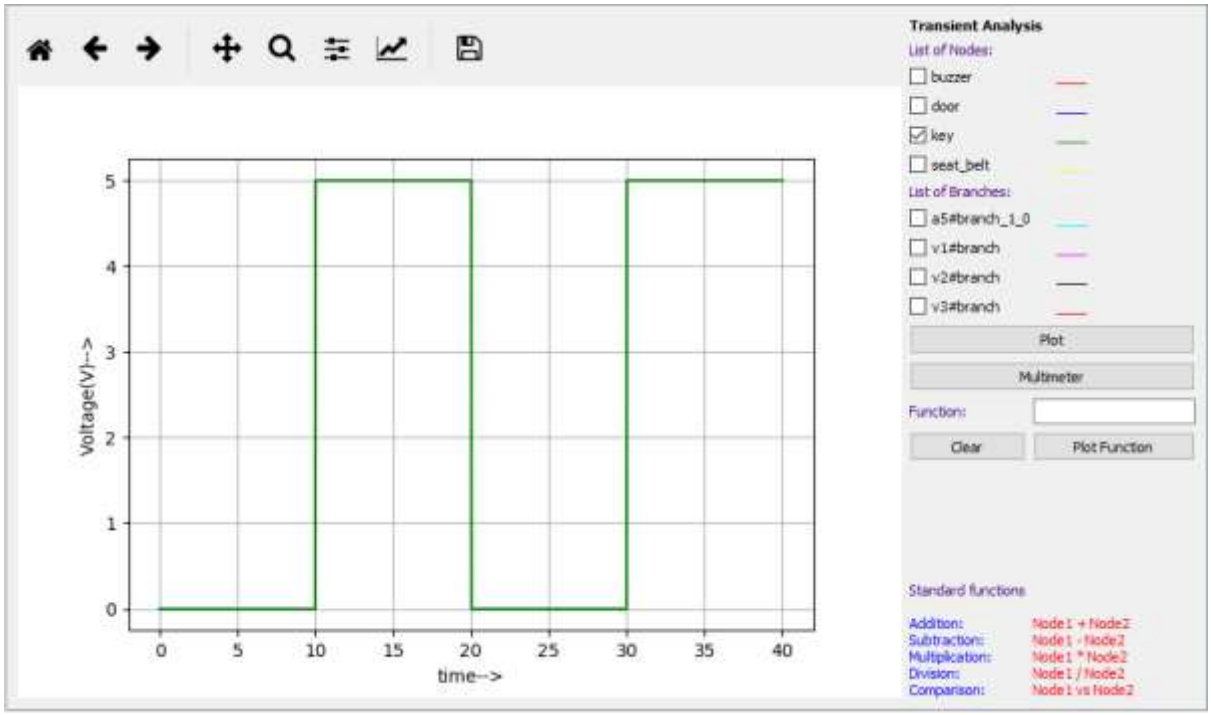


2.for key ignition

a.ngspice

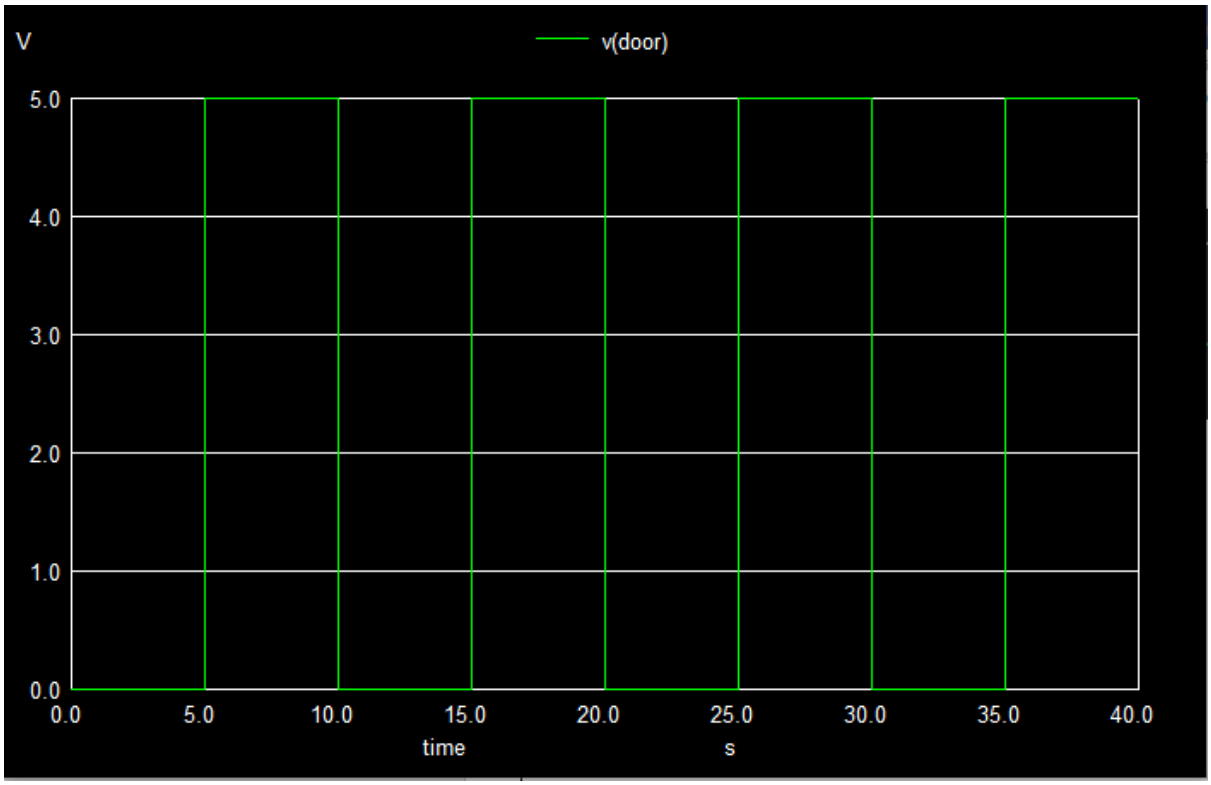


b.python plot

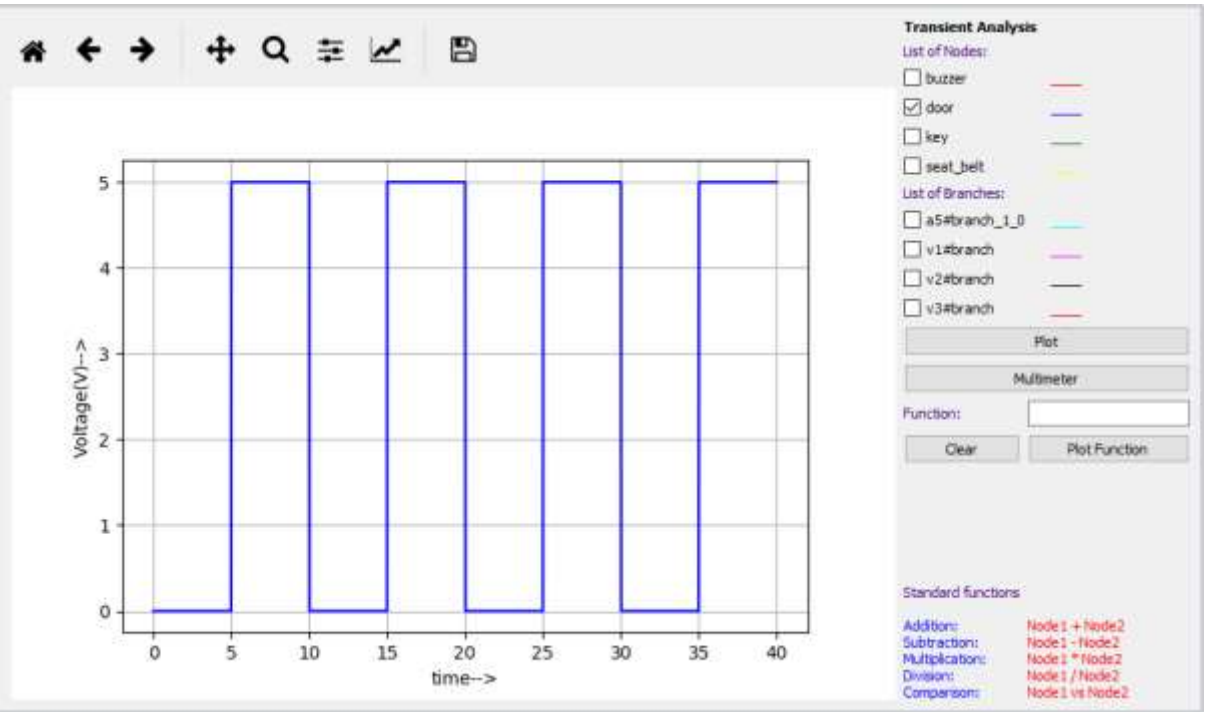


3.for door

a.ngspice

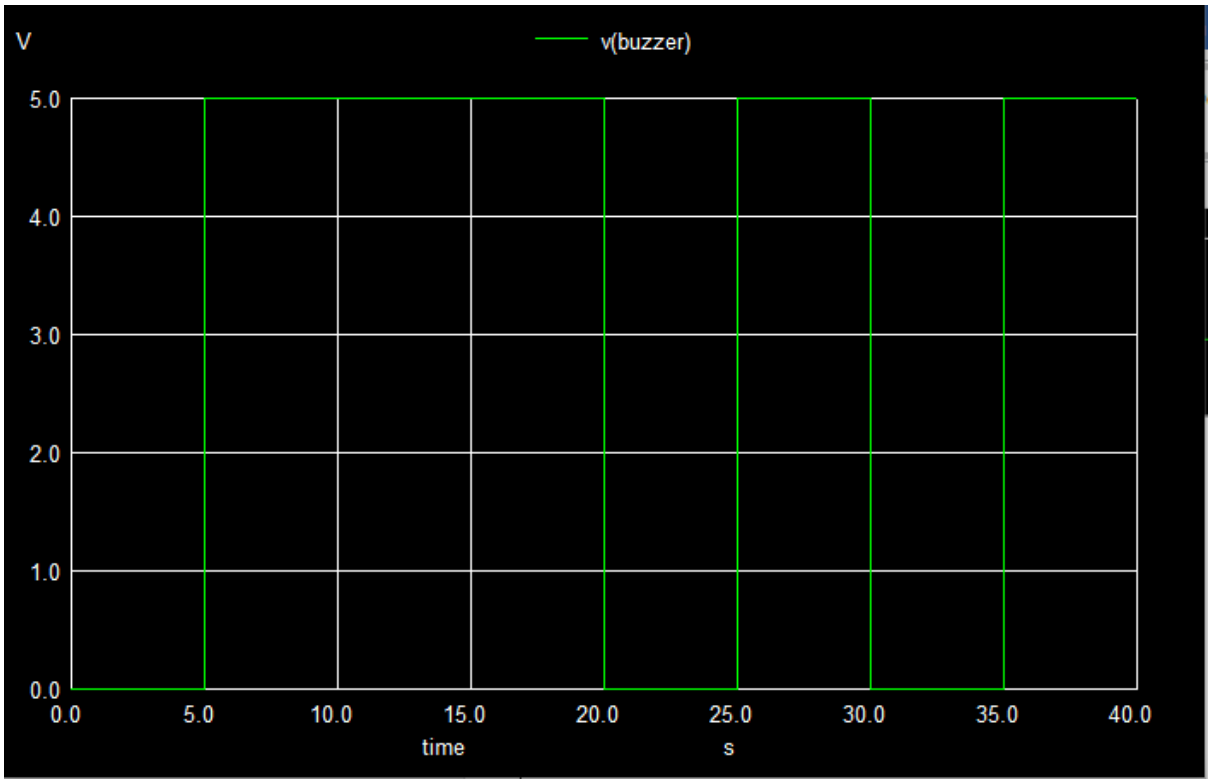


b.python plot

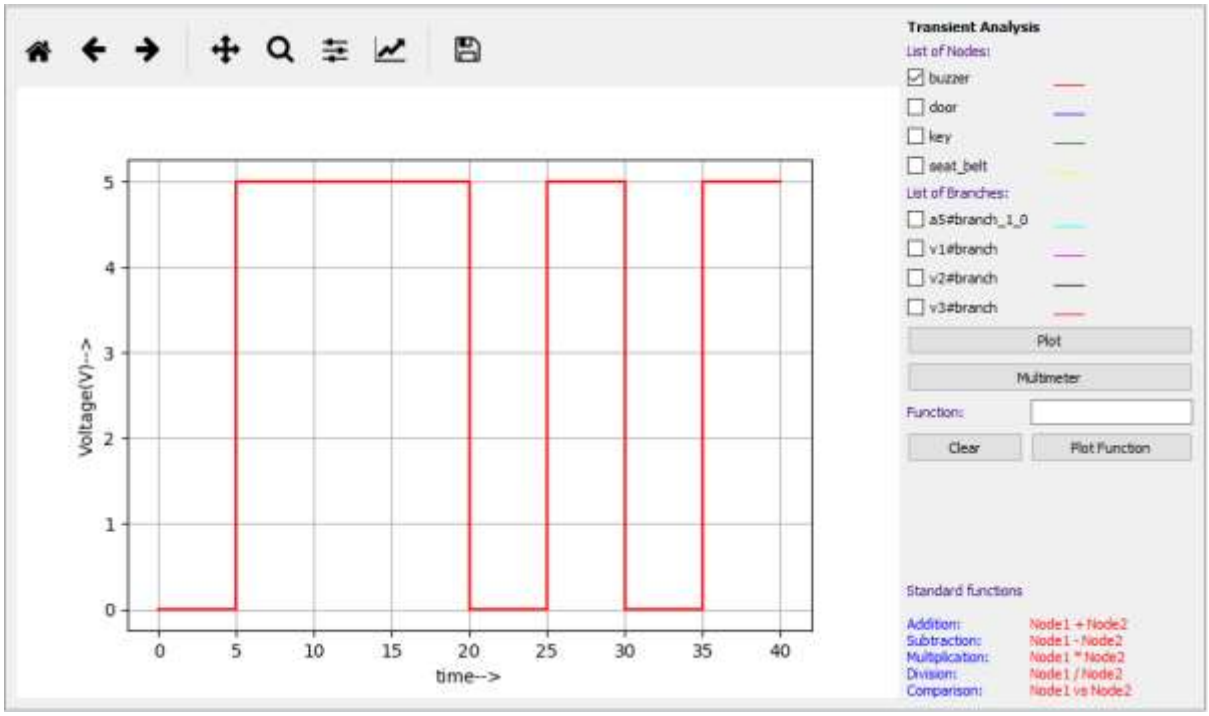


4.for buzzer

a.ngspice



b.python plot



CONCLUSION :

With the help of only one and and or gate along with not gate we can logically implement such safety buzzer circuit.

REFERENCES :

https://www.lancasterschools.org/cms/lib/NY19000266/Centricity/Domain/1055/CombinationalLogicOverview.pdf