Circuit Simulation Project

https://esim.fossee.in/circuit-simulation-project

NON-INVERTING SUMMER USING OP-AMP

by

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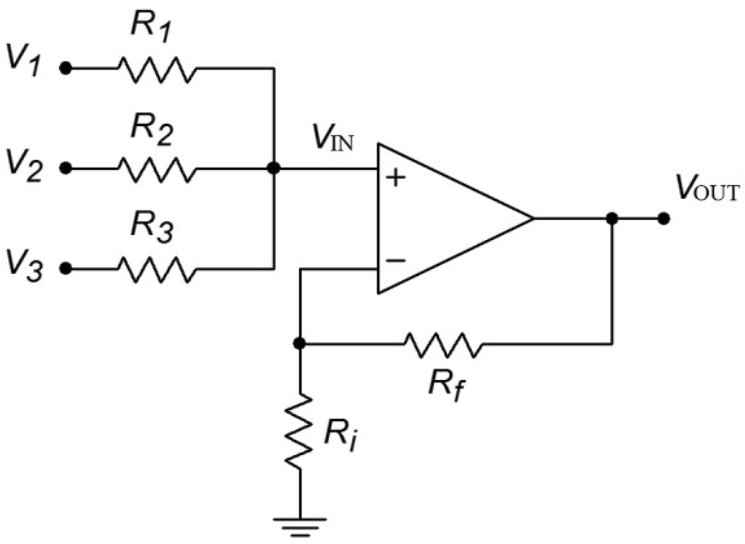
THEORY/DESCRIPTION:

The Non-Inverting summer also known as the adder is an Op-Amp based circuit where multiple input signals of different voltages are added. This is an extended version / example of the Non-Inverting amplifier but with multiple inputs. Here the input voltages are applied the inverting terminal of the Op-Amp and a part of the output is fed back to the inverting input terminal, through voltage-divider-bias feedback. Here the output is in the same phase as the input(i.e) there is no phase shift.

DESIGN:

The circuit of a Non-Inverting Summer is shown in the following image. For the sake of convenience, the following circuit consists of only three inputs, but more inputs can be added.

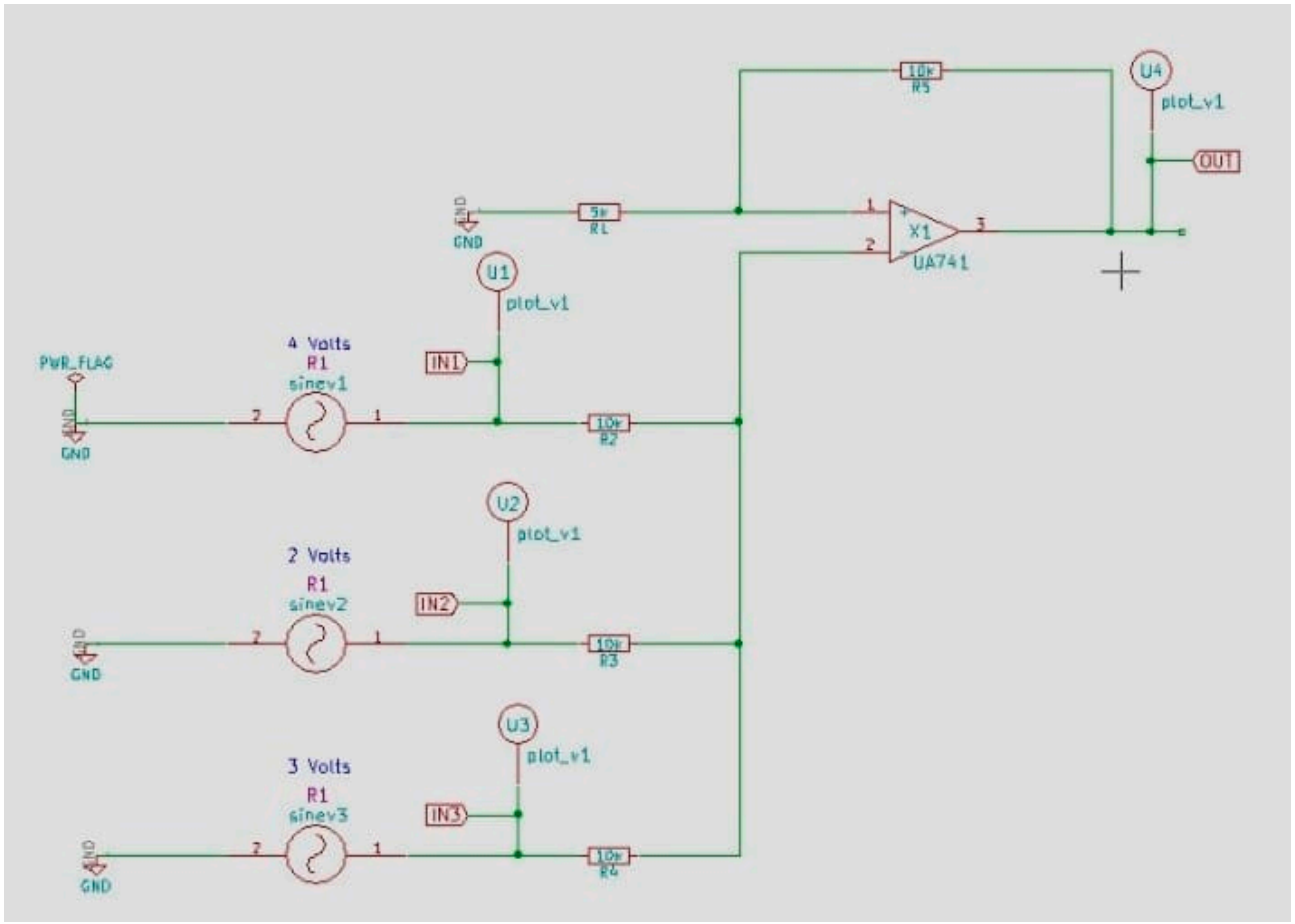


$V_{OUT} = V_{IN} (1 + (R_f / R_i))$, $V_{IN} = V_{IN1} + V_{IN2} + V_{IN3}$

Here the Rf/Ri=1 and hence the equation becomes

$V_{OUT} = V_{IN1} + V_{IN2} + V_{IN3}$

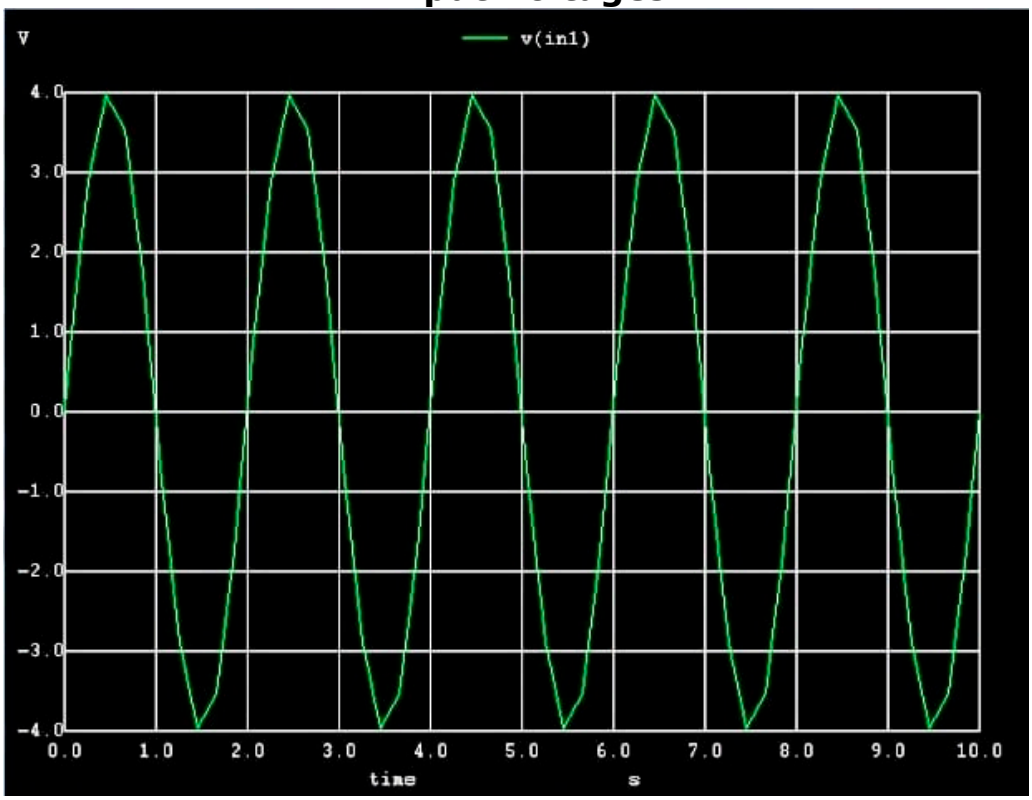
SCHEMATIC DIAGRAM:

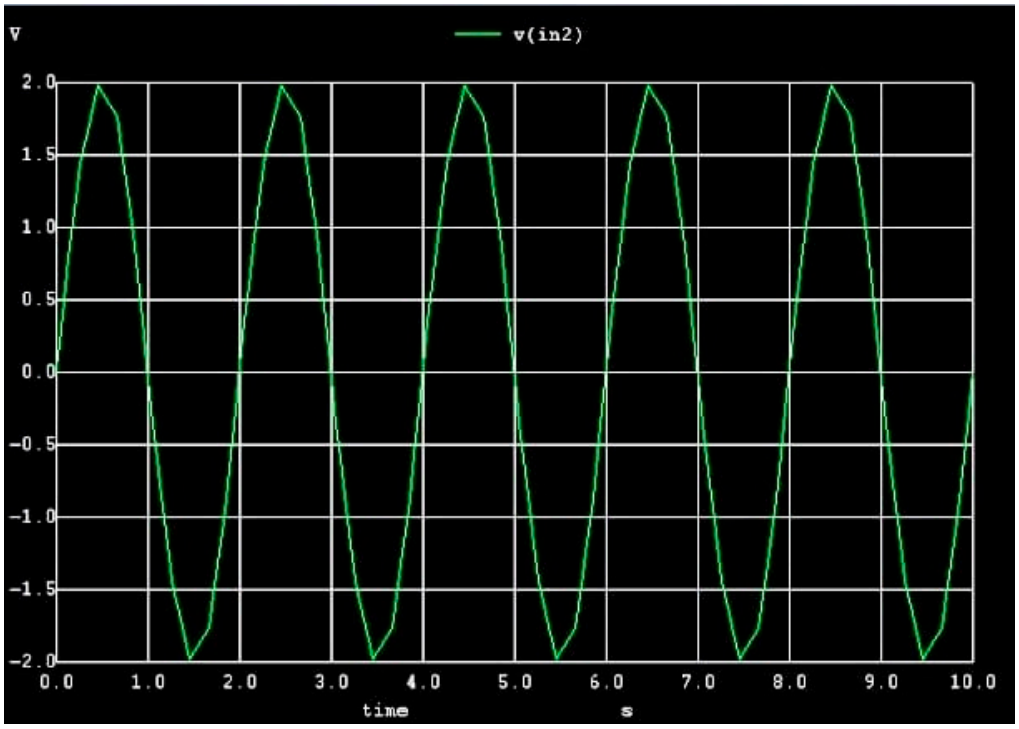


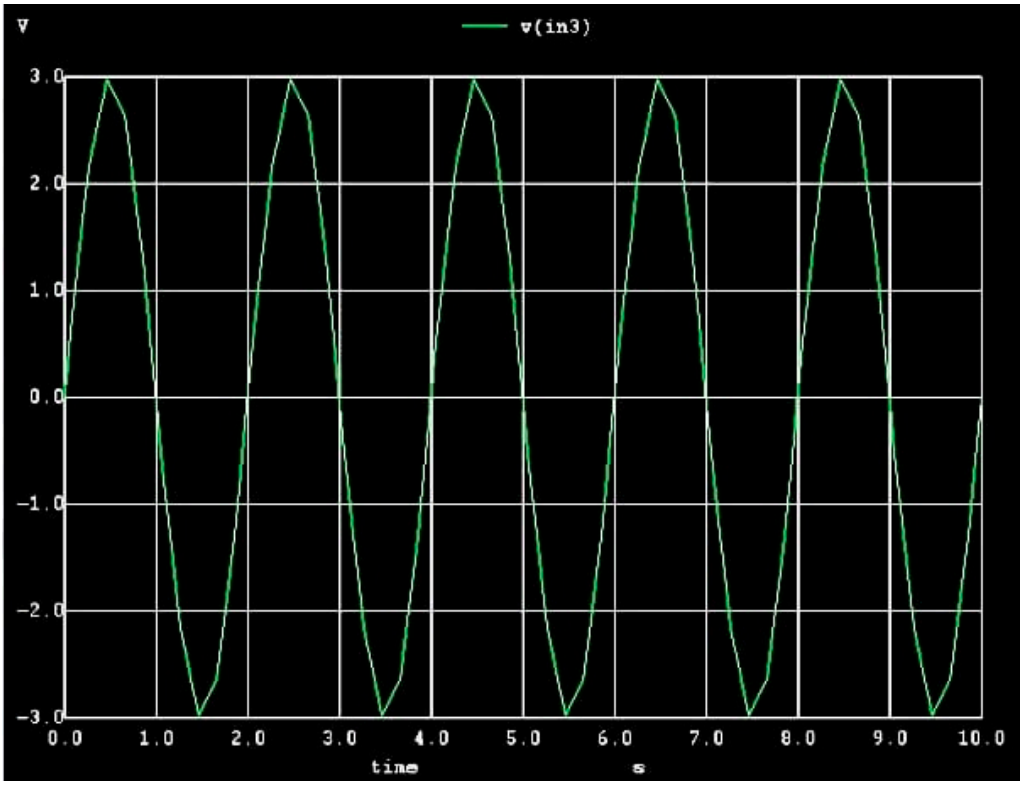
SIMULATION RESULTS:

Ngspice Plots-

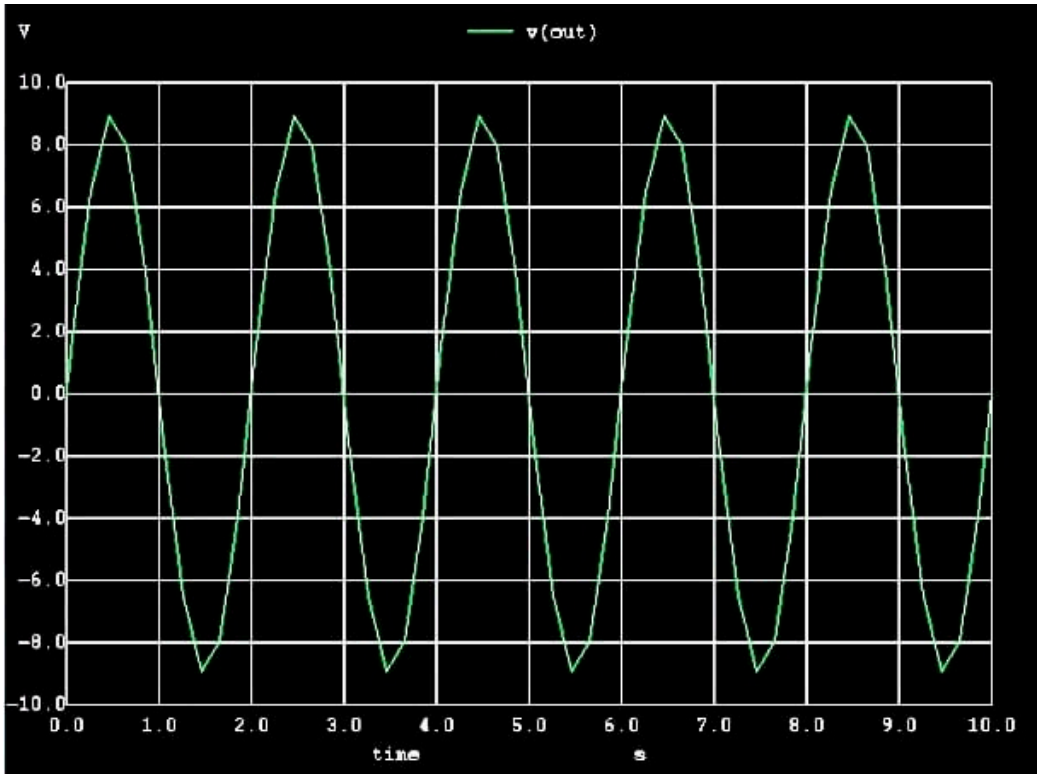
Input Voltages





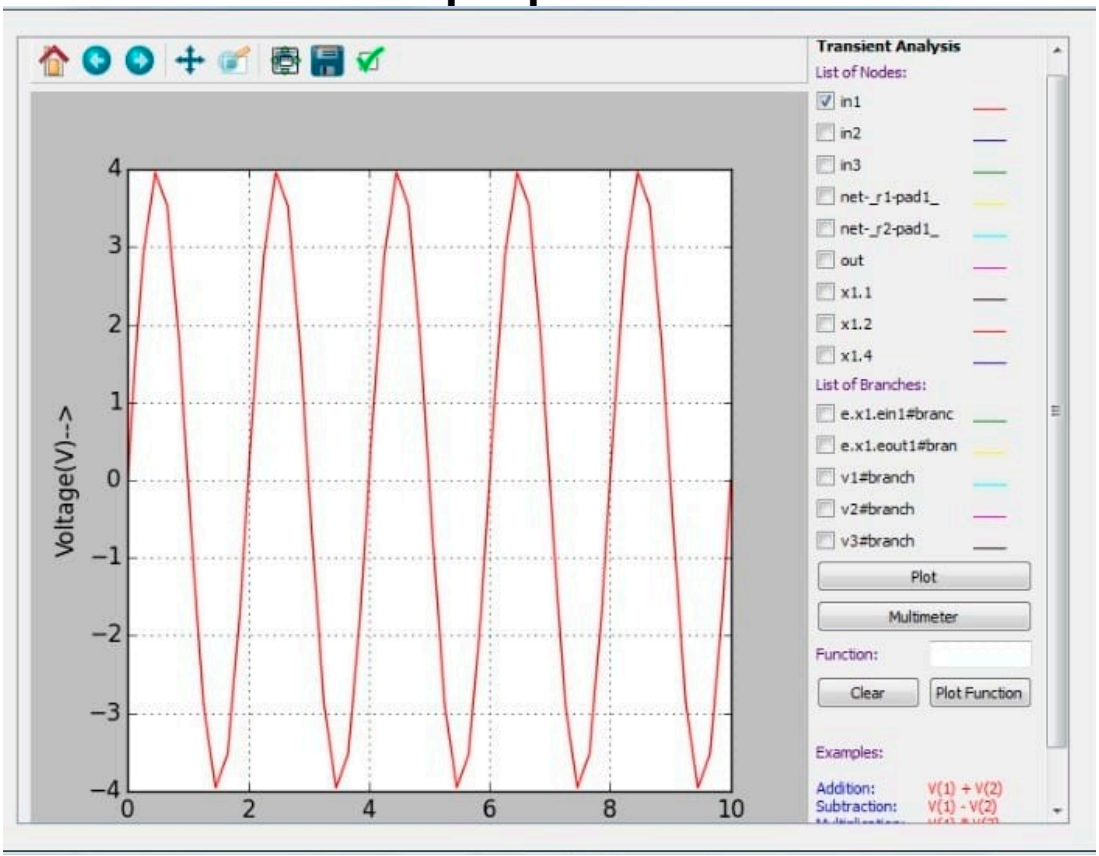


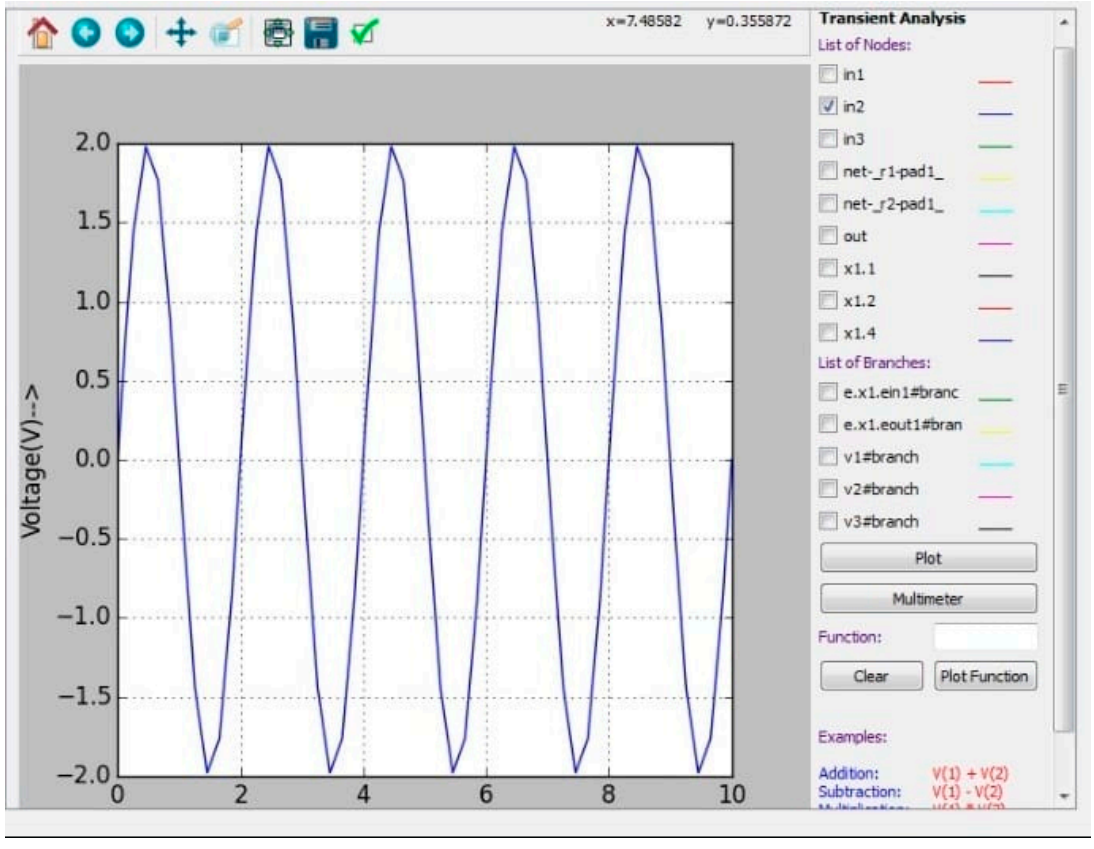
Output Voltage

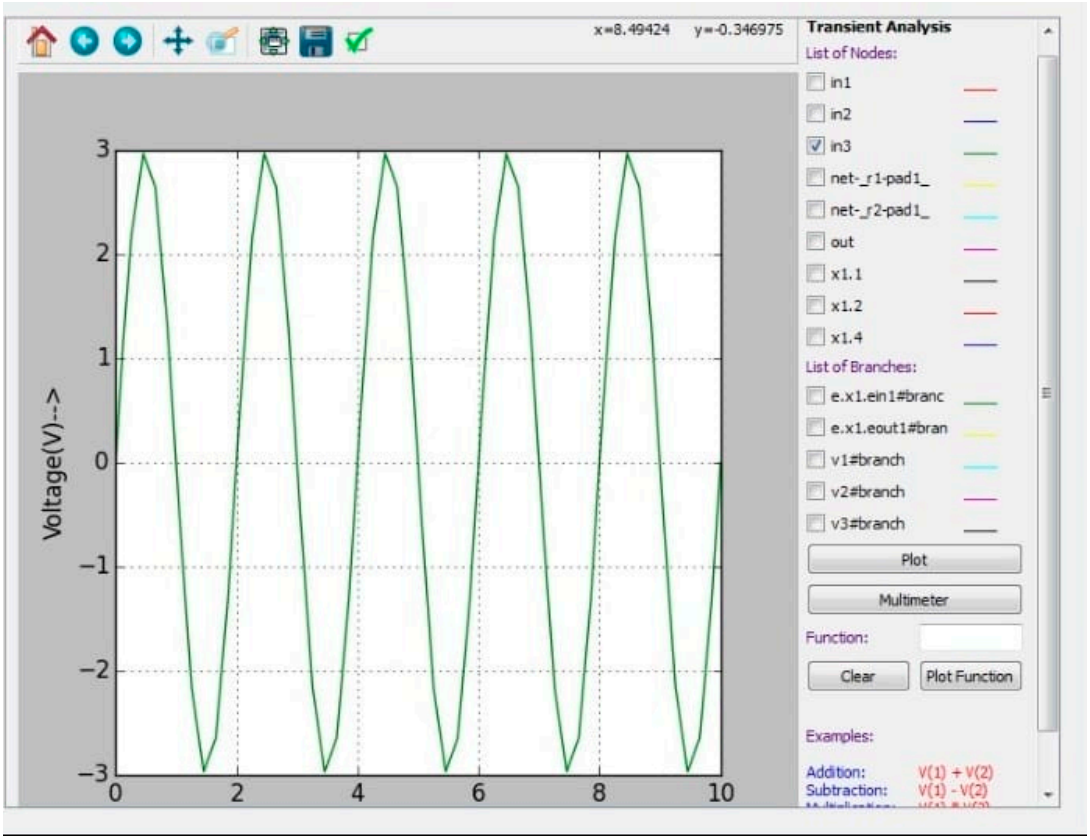


Python plots:

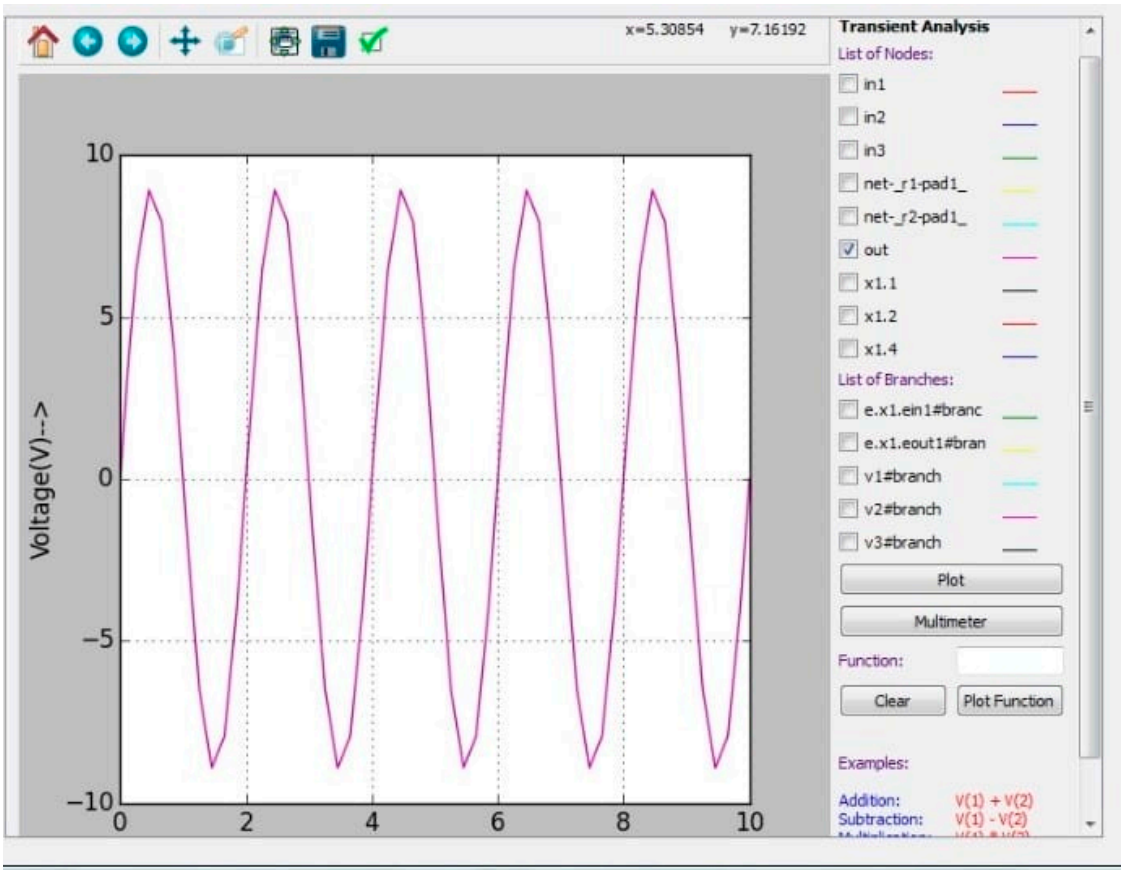
Input plots



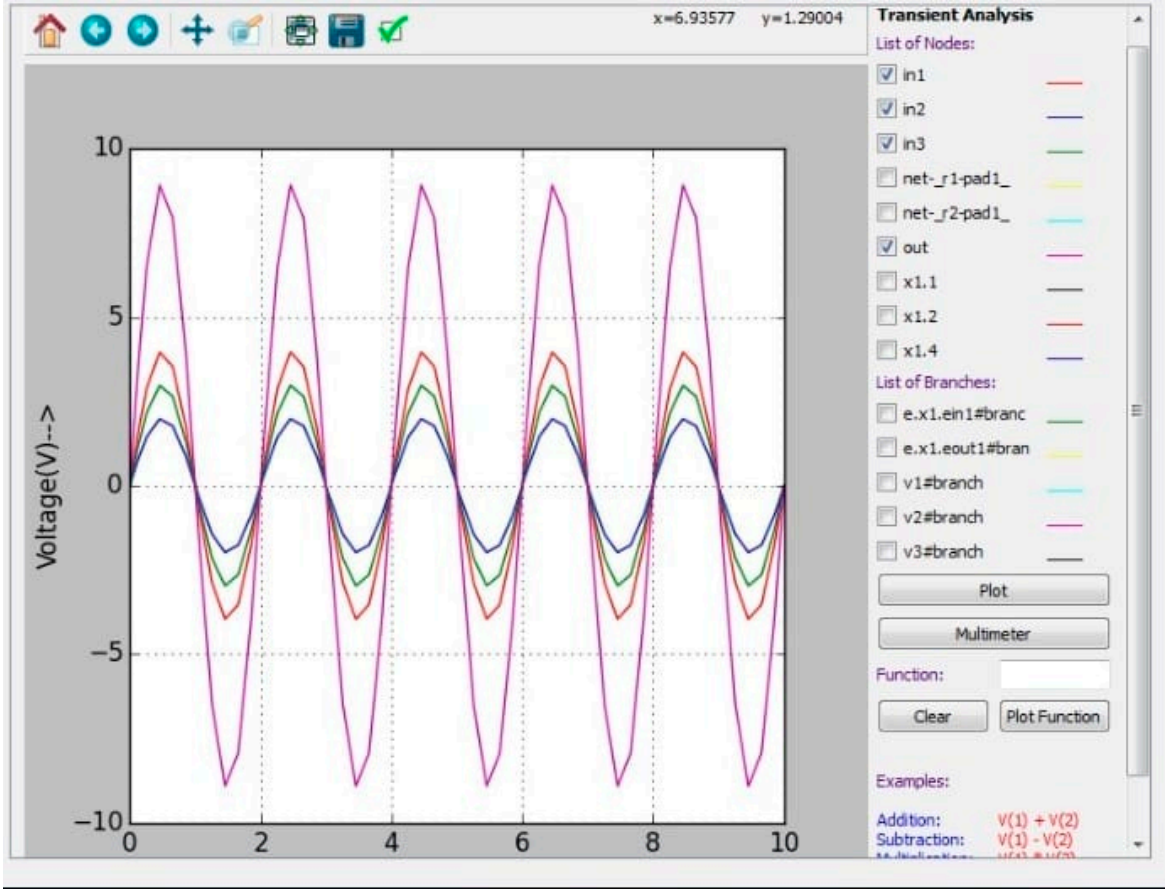



x=8.49424 y=-0.346975
Transient Analysis
List of Nodes:
in1
in2
in3
net-_r1-pad1_
net-_r2-pad1_
out
x1.1
x1.2
x1.4
List of Branches:
e.x1.ein1#branc
e.x1.eout1#bran
v1#branch
v2#branch
v3#branch
Plot
Multimeter
Function:
Clear
Plot Function
Examples:
Addition: V(1) + V(2)
Subtraction: V(1) - V(2)
Voltage(V)-->
3
2
1
0
−1
−2
−3
0
2
4
6
8
10

Output plot


x=5.30854 y=7.16192
Transient Analysis
List of Nodes:
in1
in2
in3
net-_r1-pad1_
net-_r2-pad1_
out
x1.1
x1.2
x1.4
List of Branches:
e.x1.ein1#branc
e.x1.eout1#bran
v1#branch
v2#branch
v3#branch
Plot
Multimeter
Function:
Clear
Plot Function
Examples:
Addition: V(1) + V(2)
Subtraction: V(1) - V(2)
Voltage(V)-->
10
5
0
−5
−10
0
2
4
6
8
10

Input and Output voltage Plot



CONCLUSION:

Hence, we have designed a Non-Inverting Summer and plotted the input and output waveforms using esim.

REFERENCES:

https://www.electronicshub.org/summing-amplifier/