



Inspiring Excellence

Course Code: CSE251

Course Title: Electronic Devices and Circuits

Semester: Spring-2023

STUDENT NAME

ID

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Experiment Number: 01

Experiment Name: Study of Op-Amp: Comparator, Inverting, Amplifier,
Non-Inverting Amplifier

Group No: 03

Section: 12

Date of performance: 31/01/2023

Date of Submission: 06/ 02/ 2023

Submitted by: Md. Mahir Faisal, ID: 21301371

1. Data Sheet:

Data Sheet

Task-02:

Input Amplitude from oscilloscope, $v_I = 2.08V$

Output Amplitude from equation, $v_O = -\left(\frac{R_2}{R_1}\right) \times v_I = -5.4 \text{ V}$


Output Amplitude from oscilloscope, $v_O = 5.68V$

Task-03:

Input Amplitude from oscilloscope, $v_I = 2.29 \text{ V}$

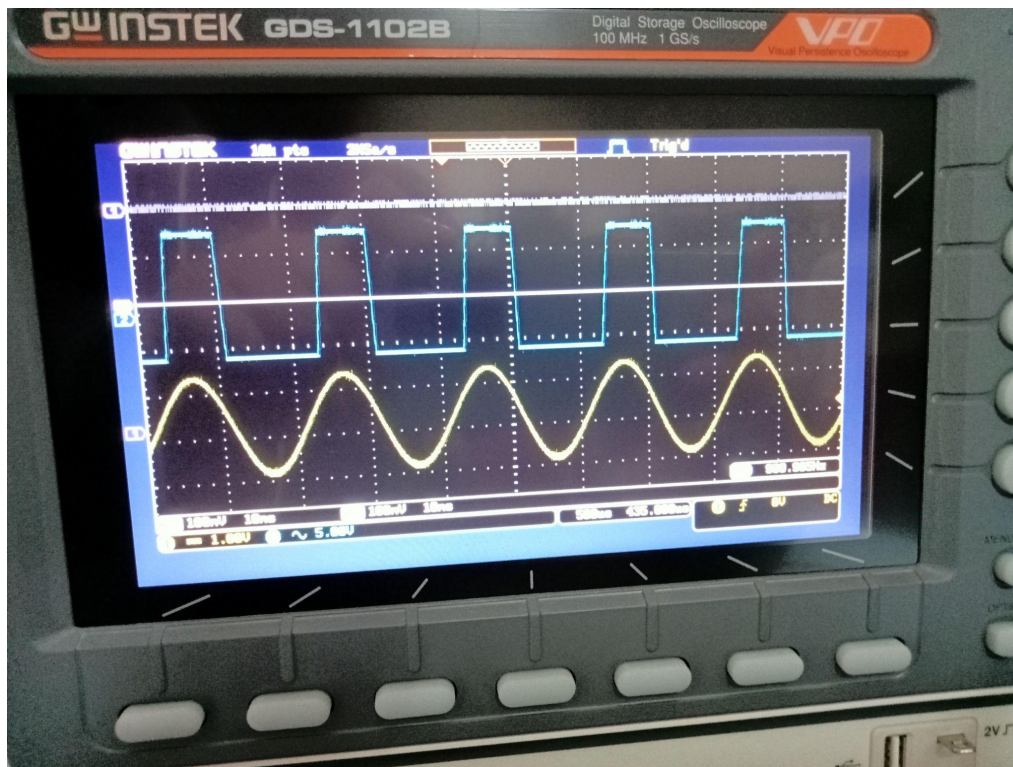
Output Amplitude from equation, $v_O = (1 + \frac{R_2}{R_1}) \times v_I = 8.29V$

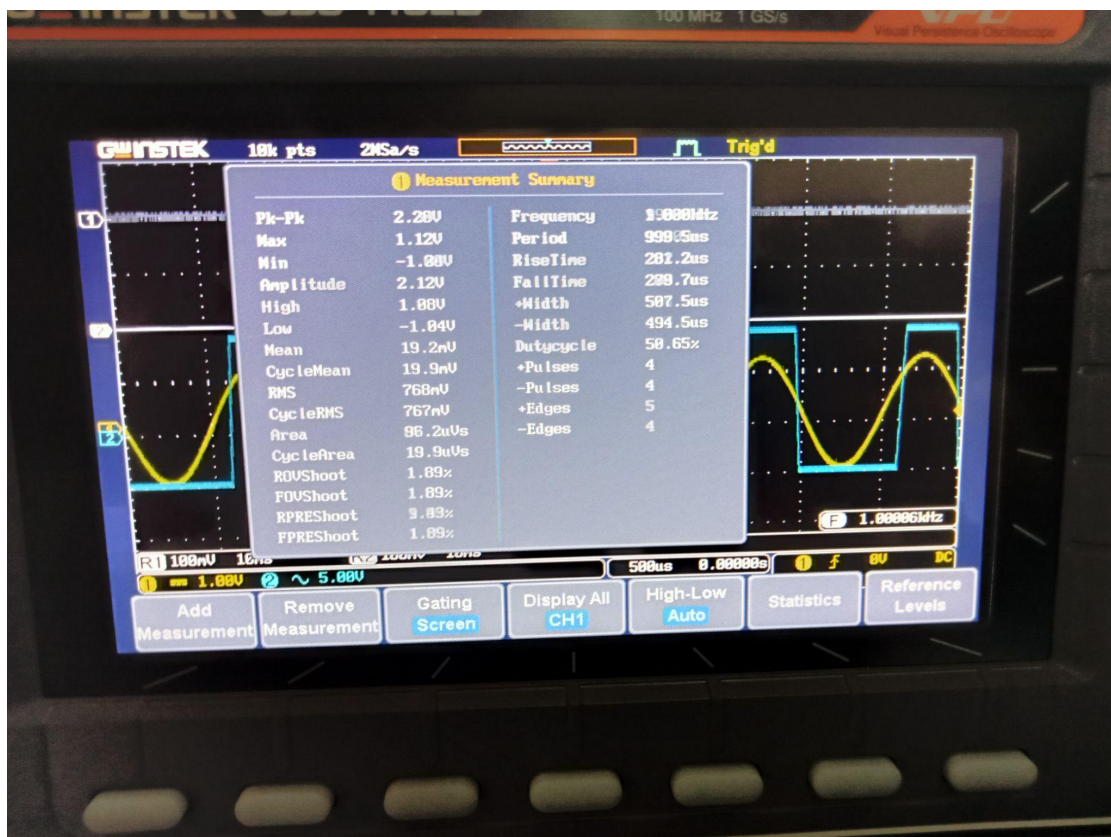
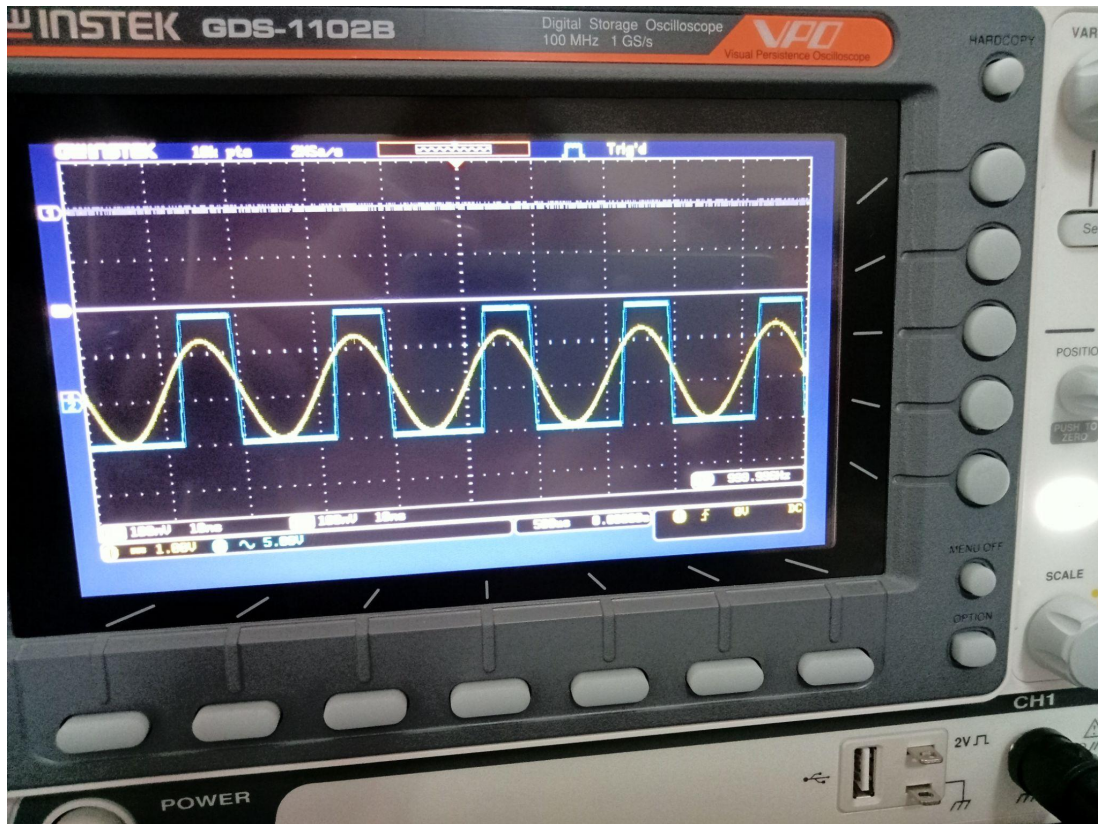
Output Amplitude from oscilloscope, $v_O = 8.16 \text{ V}$

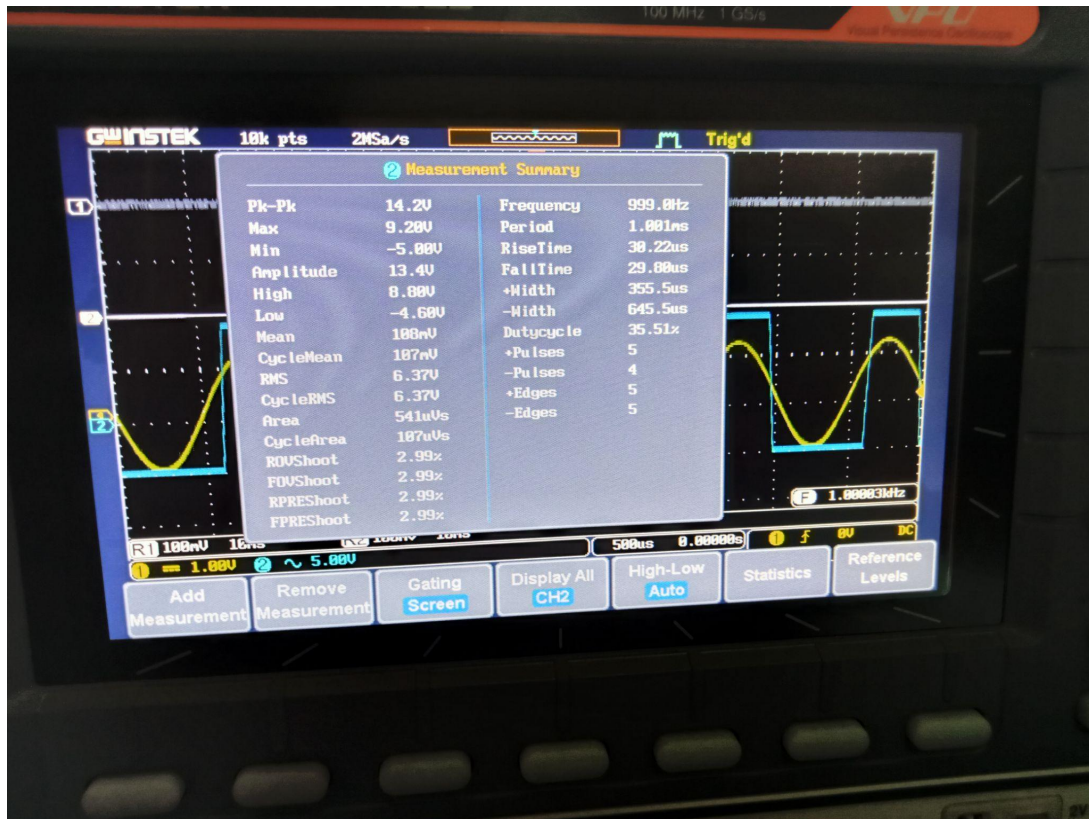


2. Graph display in Oscilloscope:

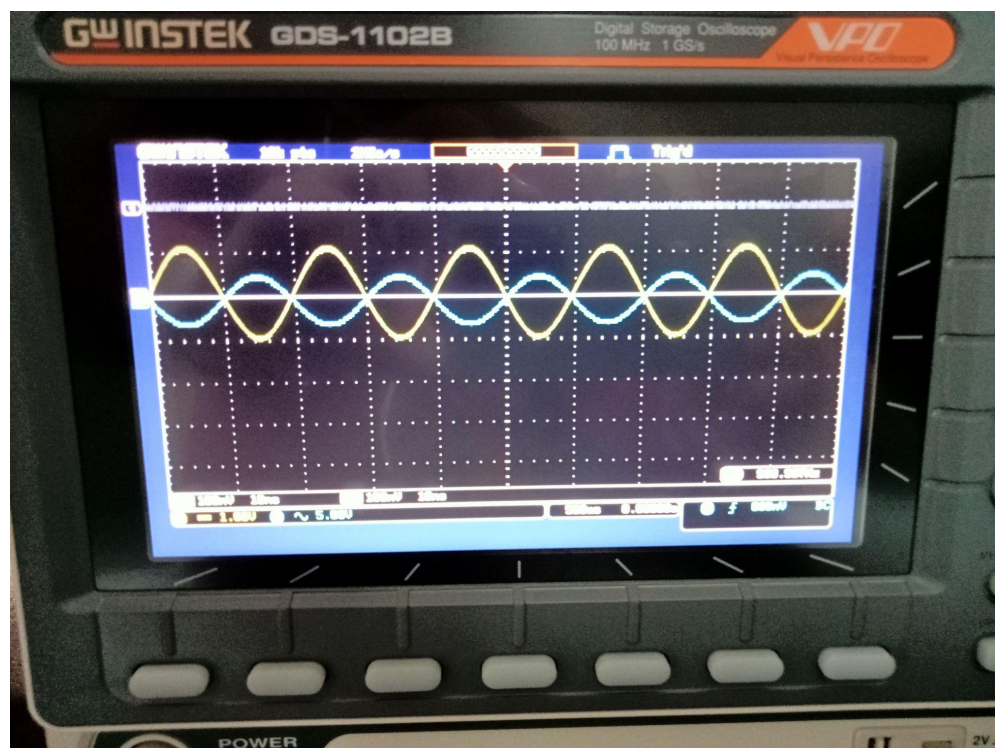
Task - 01

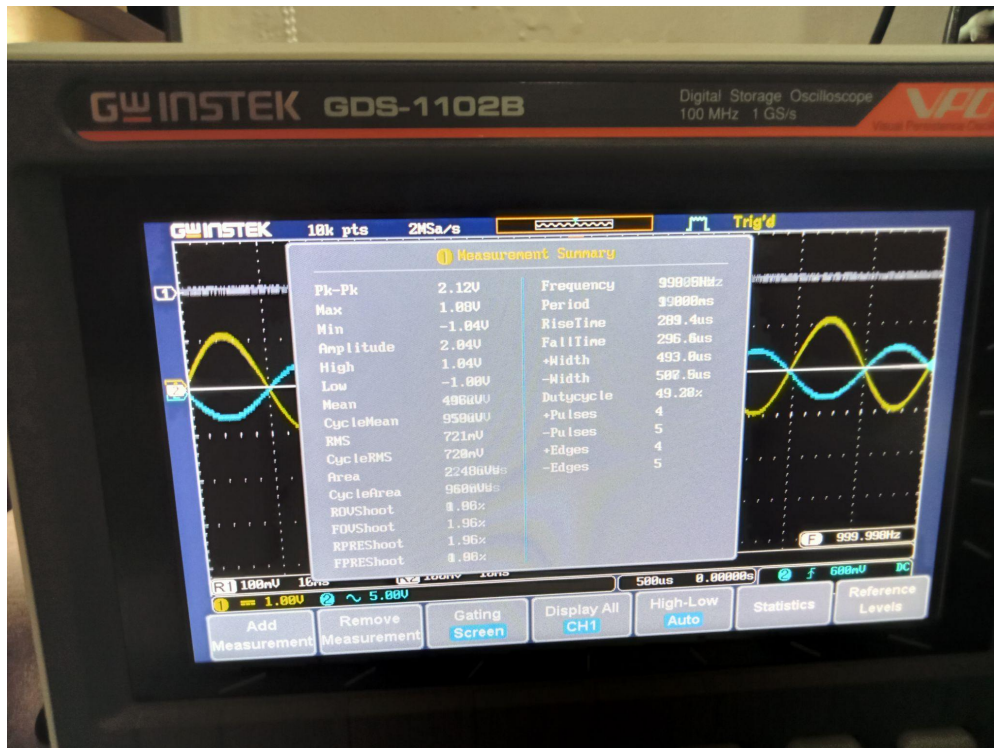




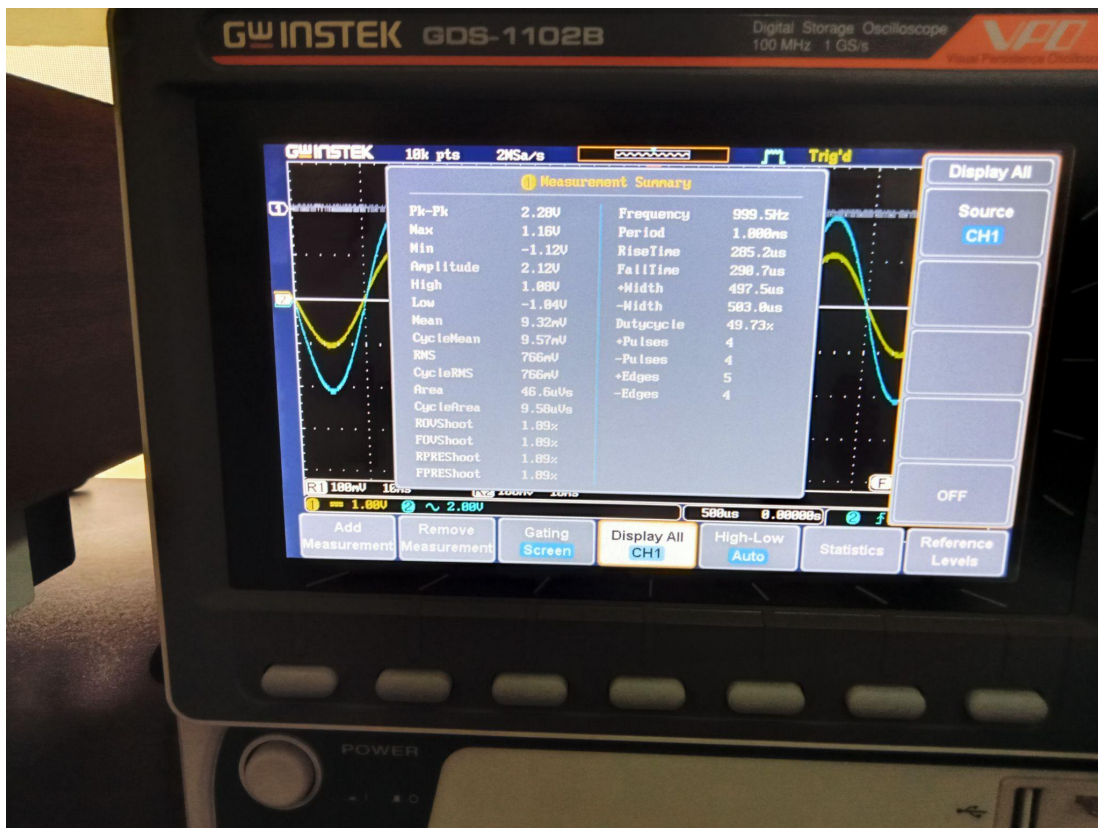
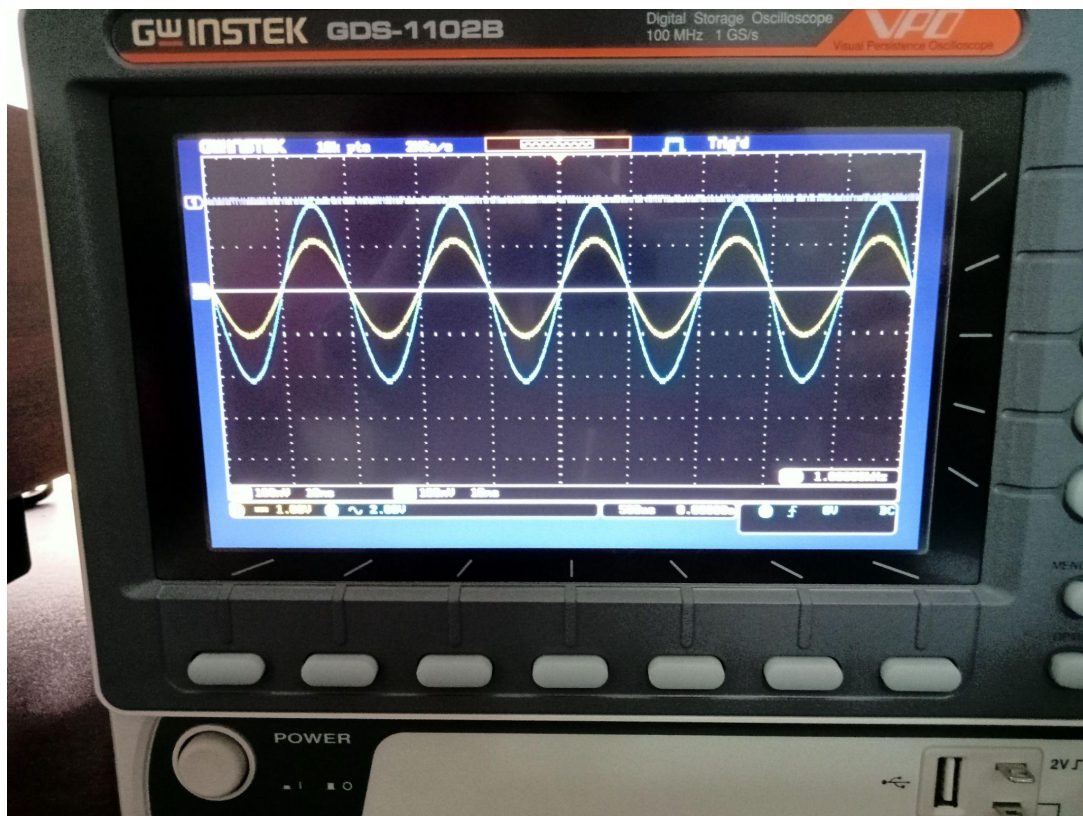


Task - 02





Task - 03





3. Test your understanding:

Answer the following questions:

1. You are given an Op-Amp comparator with $v_1 = 4V(p-p)$, sine wave and $v_2 = V_{REF} = -1V$. Draw the waveform of v_1 , v_2 and v_o in the same graph with proper labels.
2. You are given an inverting amplifier with $v_i = 4V(p-p)$, $R_1 = 1k\Omega$, $R_2 = 2.2k\Omega$. Draw the waveform of v_i and v_o in the same graph with proper labels.
3. You are given a non-inverting amplifier with $v_i = 4V(p-p)$, $R_1 = 1k\Omega$, $R_2 = 2.2k\Omega$. Draw the waveform of v_i and v_o in the same graph with proper labels.

1 No Solution

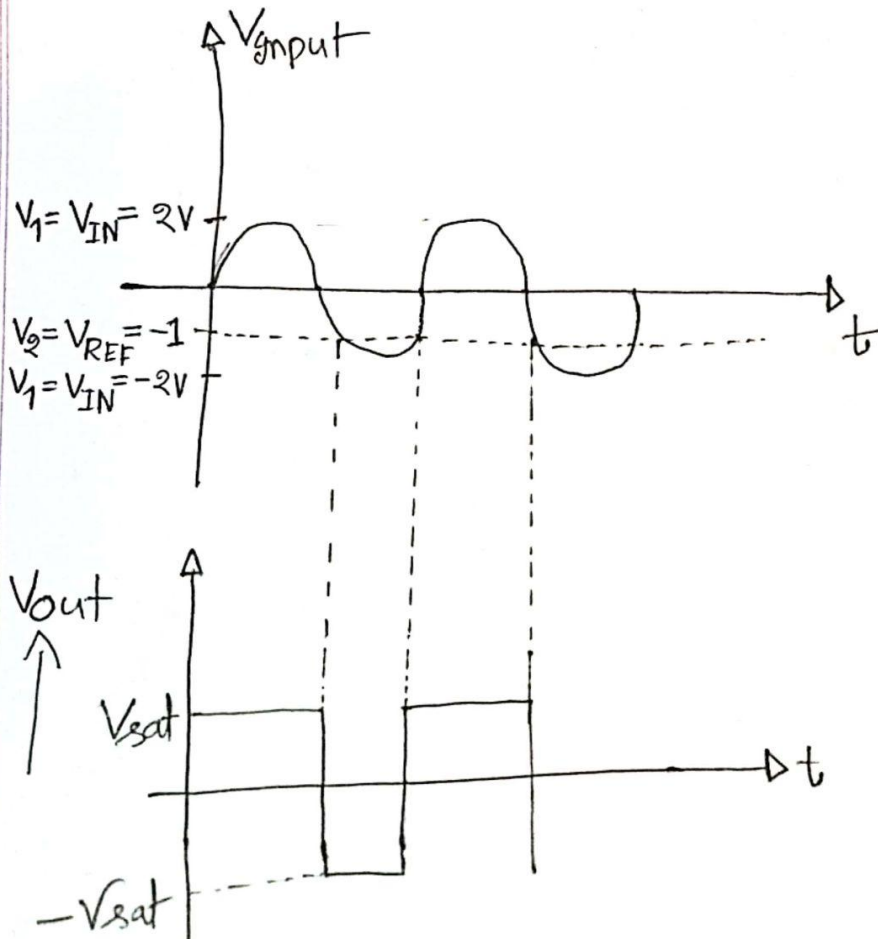
1 No Solution

1.

Given that,

$$V_1 = 4 \text{ V (p-p)},$$

$$V_2 = V_{REF} \\ = -1 \text{ V}$$



2 No Solution

2 No Solution

2. Given that,

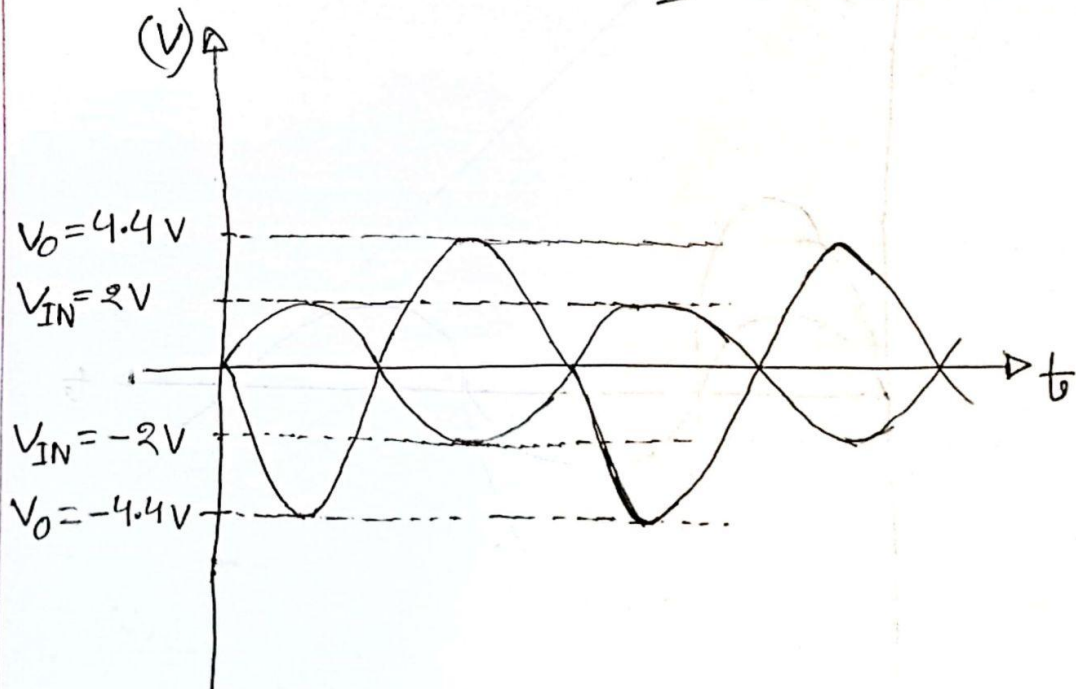
$$V_{IN} = 4V \text{ (P-P)};$$

$$R_1 = 1k\Omega;$$

$$R_2 = 2.2k\Omega$$

$$V_{out} = -\left(\frac{R_2}{R_1}\right) \times V_i = -\left(\frac{2.2}{1}\right) \times 4$$

$$= -8.8V \text{ (P-P)}$$



3 No Solution

3 No Solution

3.

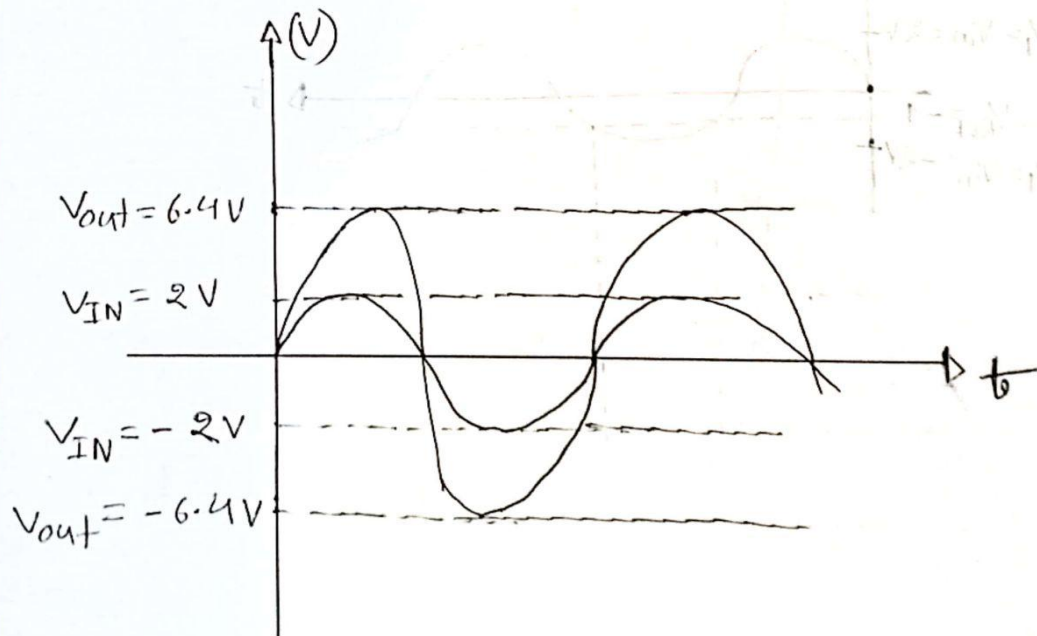
Given that,

$$V_{IN} = 4 \text{ V (p-p)};$$

$$R_1 = 1 \text{ k}\Omega;$$

$$R_2 = 2.2 \text{ k}\Omega$$

$$V_o = \left(1 + \frac{R_2}{R_1}\right) \times V_{IN} = \left(1 + \frac{2.2}{1}\right) \times 4 \text{ V}$$
$$= 12.8 \text{ V (p-p)}$$



Discussion

Here, we have done three experiments with operational amplifiers. In our first experiment, an op-Amp served as the comparator. There, we first used +8V and -8V to bias the operational amplifier. After that, we connect the inverting input of the op-Amp with 0.5v. We took this voltage from the DC power supply and the non-inverting input from the function generator 2v (p-p) sine wave.

In our second experiment, we have seen, op-Amp as an inverting amplifier. Here, we grounded the function generator's inverting and non-inverting terminals at a voltage of 2 volts peak to peak. Here, output voltage is in 180 phase with the input voltage.

In our 3rd experiment, we have seen an op-amp as a non-inverting amplifier. Here, we connected the non-inverting terminal to the 2v voltage source and we grounded the inverting terminal. The op-amp raises the input voltage, but the output voltage is in phase with the input voltage.