Expt. No. 1 Date 30.07.24

Half & Full wave Voltage Rectifiers

Aim: To build a full wave rectifier using:
1. Bridge design (without 7805 regulator)
2. Bridge design (with 7805 regulator)
3. Bridge rectifier as a dual power supply. (without regulator)
4. Bridge rectifier as a dual power supply (with regulator)
5. Half wave rectifier using function generator.

Theory: Rectifier circuits are used to obtain non-zero DC components from an A.C input signal. They can be of 2 types:
1. Half wave rectifier: These circuits block the negative part of the input AC signal & returns only the positive component.
2. Full wave rectifier: These circuits pass both halves of the input wave, one unchanged & the other inverted. These can be of 2 types:
a. Full wave center tapped rectifier circuit
b. Full wave bridge rectifier circuit.

In a half wave rectifier circuit, during the positive half cycle, the diode is forward biased, due to which that half of the input waveform is not inhibited. During the negative half cycle, the diode is reverse biased. Due to high resistance during reverse bias condition, input signal is prohibited.
In a full wave bridge rectifier, in both half cycles.

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2 of the diodes are forward biased, so the input wave is fully rectified.

Adding a capacitor in parallel to the bridge allows for ~~rectification~~ reduction in ripple voltage, according to the formula:

$$V_r = \frac{V_{in}}{R_L C f}$$ where

V_r = Ripple voltage $V_{in} \rightarrow$ input voltage

R_L = Load resistance

f = frequency of input wave.

A voltage regulator is used to provide a stable output voltage without any ripples. The peak input voltag must be atleast 2V more than regulating voltage for the voltage regulator to function.

Procedure:

1. Connect & rig up the circuits as shown in the circuit diagrams
2. Plot output waveforms & measure peak to peak voltag of output.

Calculations.

1a) Power rating of resistor to be used:

$P = \frac{V_P^2}{R}$, where:

V_P = peak voltage = $12\sqrt{2}\,V \approx 17V$

$R = 2.2K\Omega$

$P = \frac{17^2 \times 10^{-3}}{2.2} = 0.073W \approx 0.01W$

1b) $V_R \leq 0.5$

$V_R = \frac{V_{in}}{R_L C F \times 2}$

$C = \frac{V_{in}}{V_R \cdot R_L f_{in} \times 2}$

$= \frac{12\sqrt{2}}{0.5 \times 500 \times 50 \times 2}$

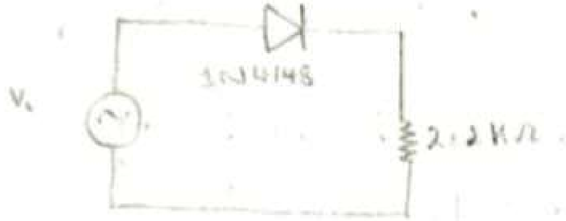
$= 6.8 \times 10^{-4}$ F

$\approx 680\mu F$

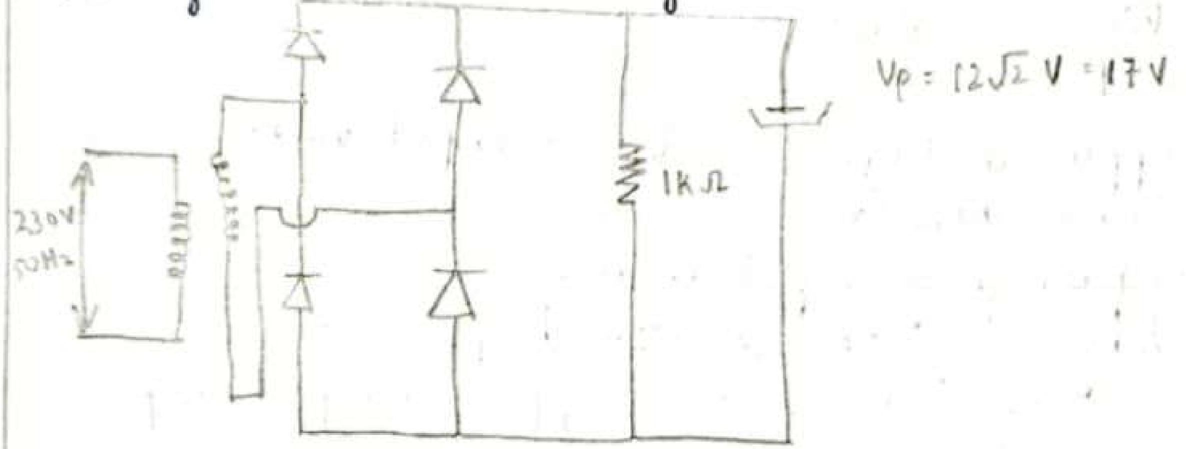
$C \geq 680\mu F$.

$\therefore$ $1000\mu F$ capacitor has been chosen.

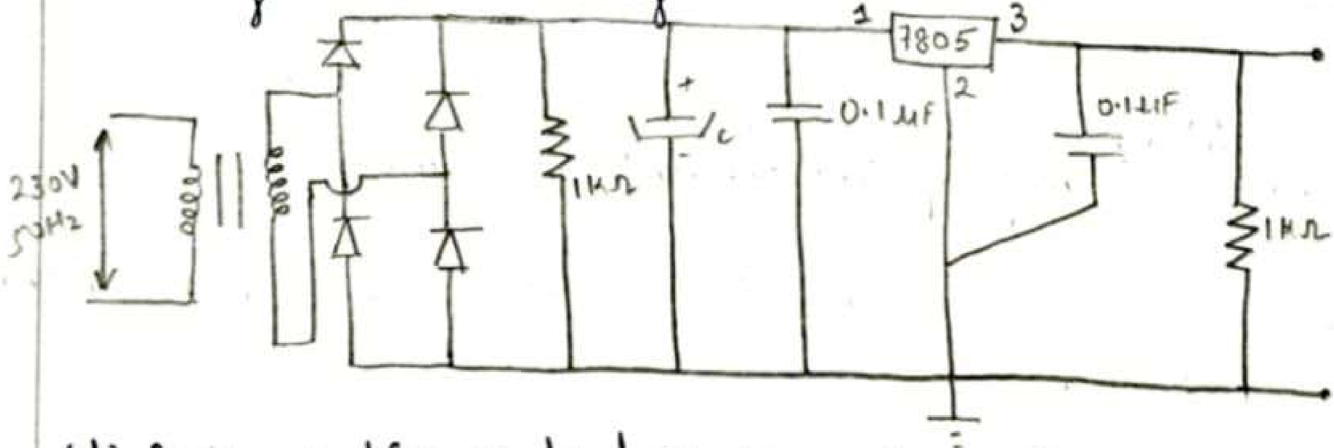
1a) Half wave rectifier using function generator.



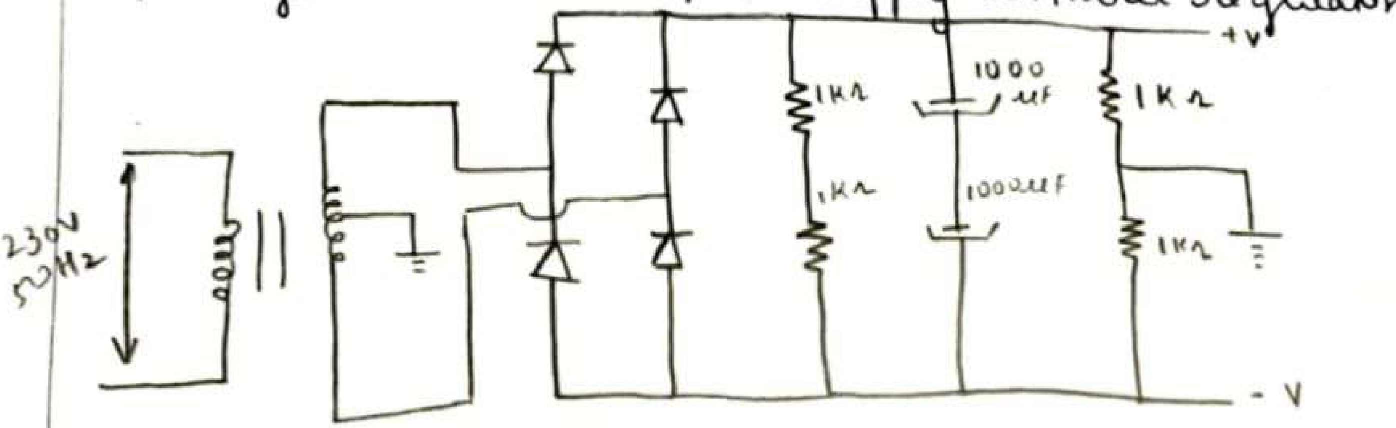
1b) Bridge rectifier without regulator



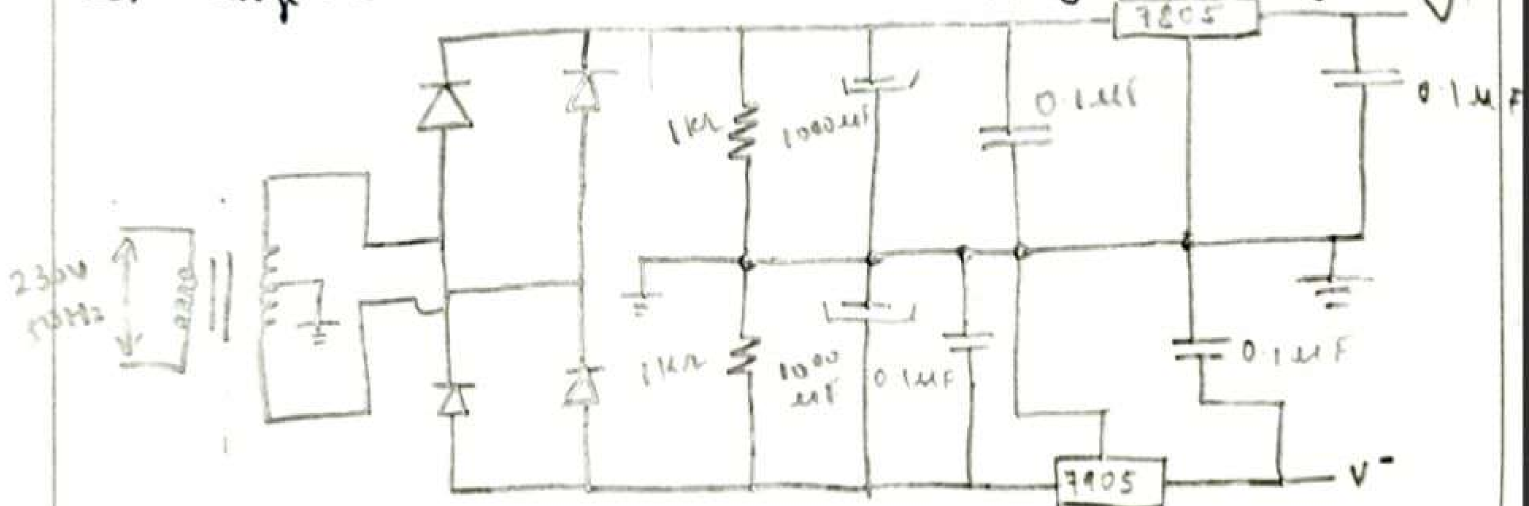
1c) Bridge rectifier with regulator



1d) Bridge rectifier as dual power supply without regulator

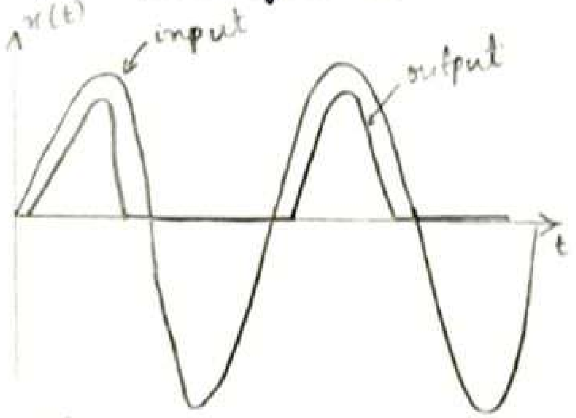


1e) Bridge rectifier as a dual power supply with regulator

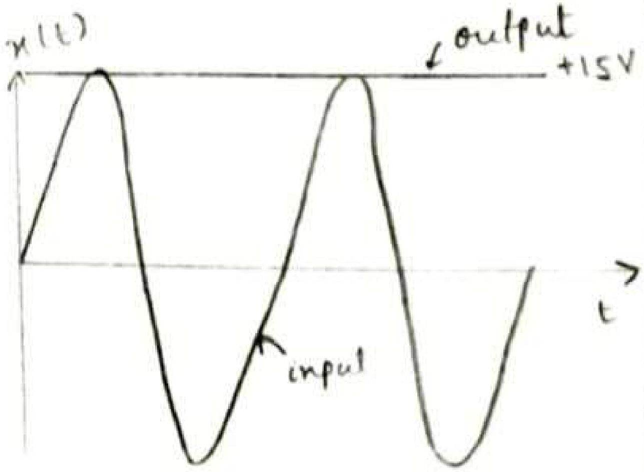


Output waveforms:

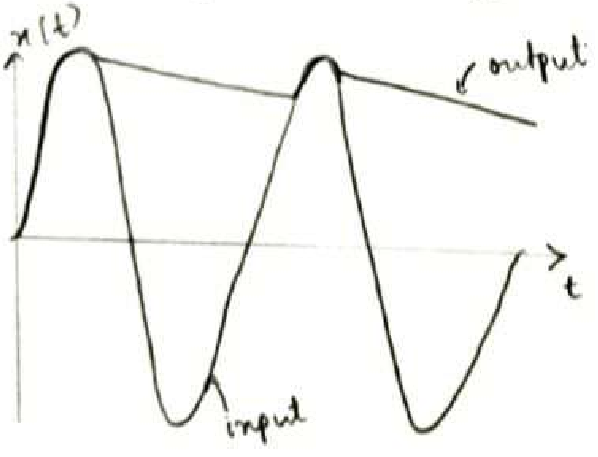
1a)



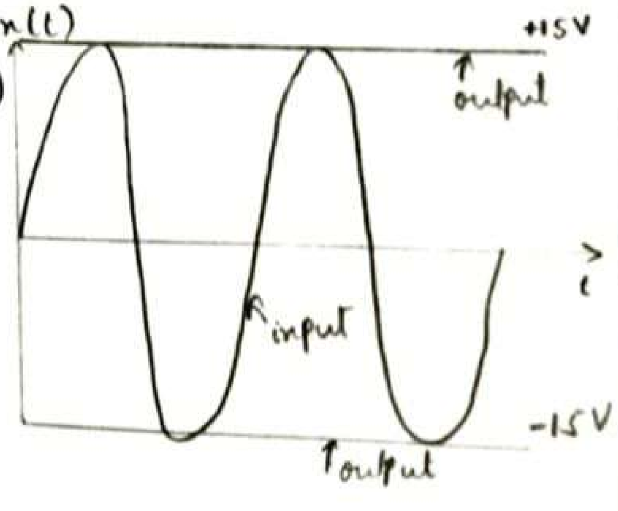
1c)



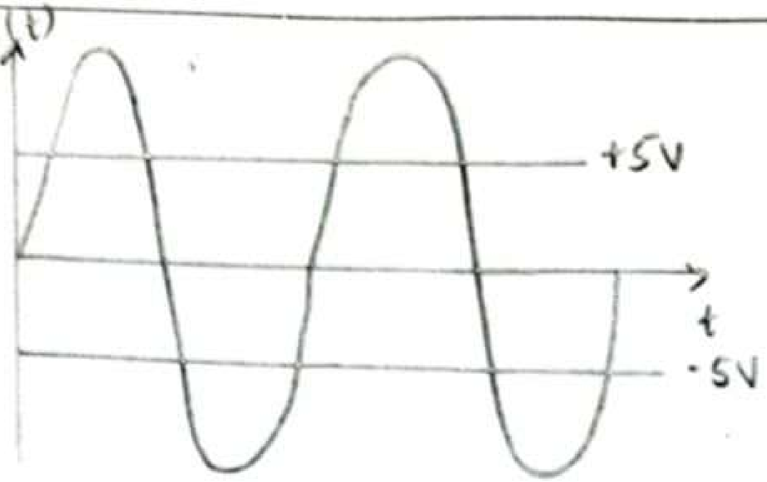
1b)



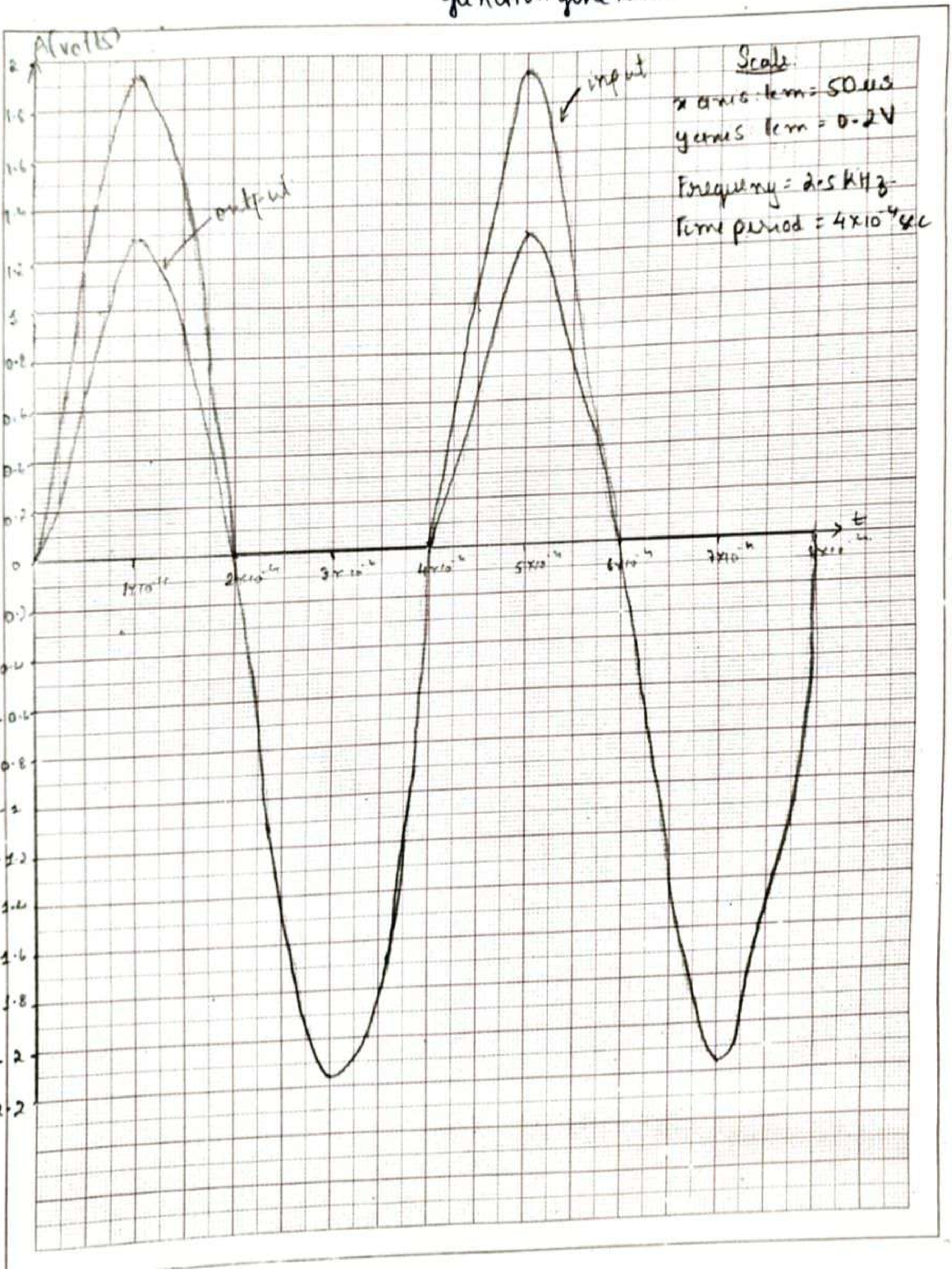
1d)



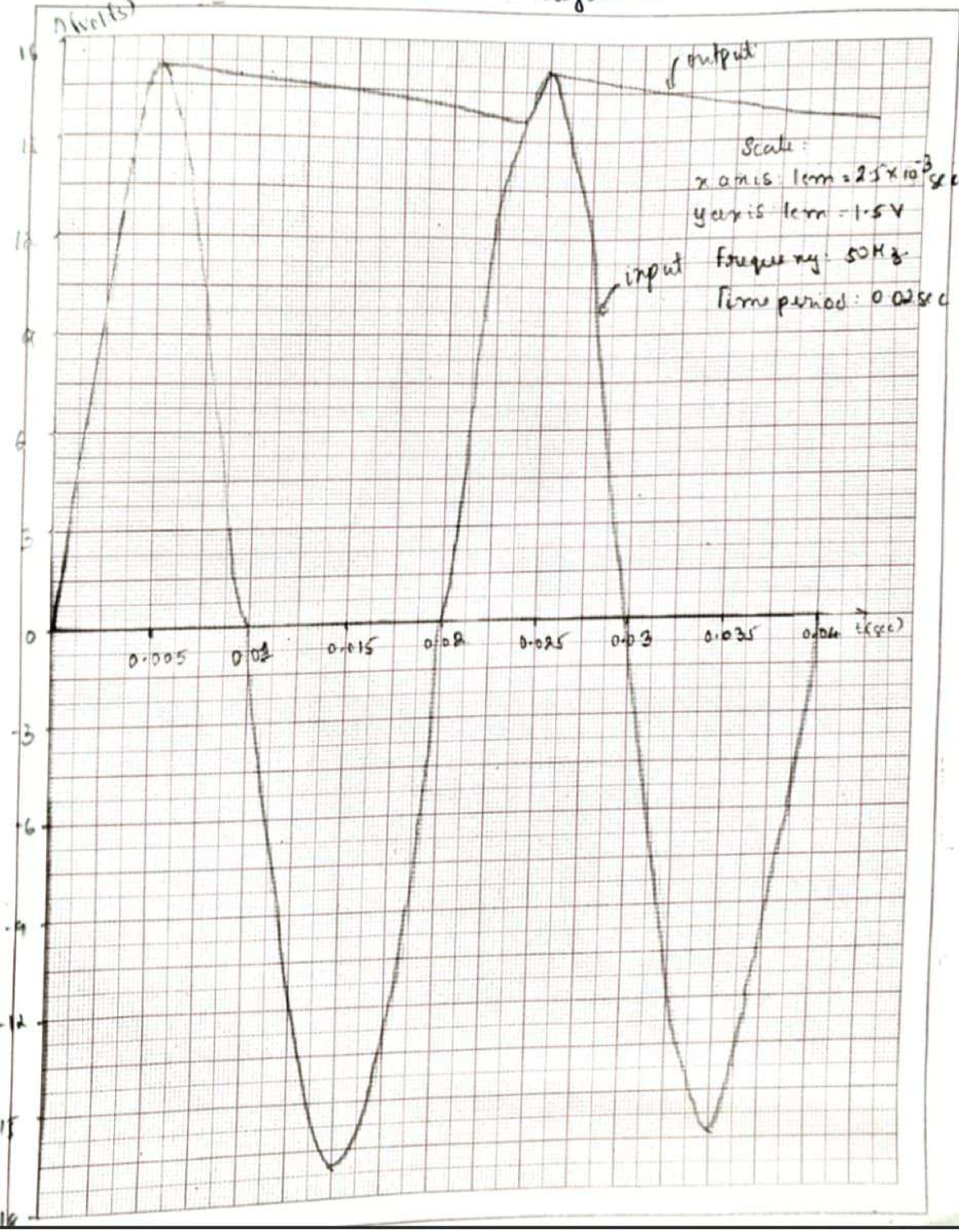
1e)



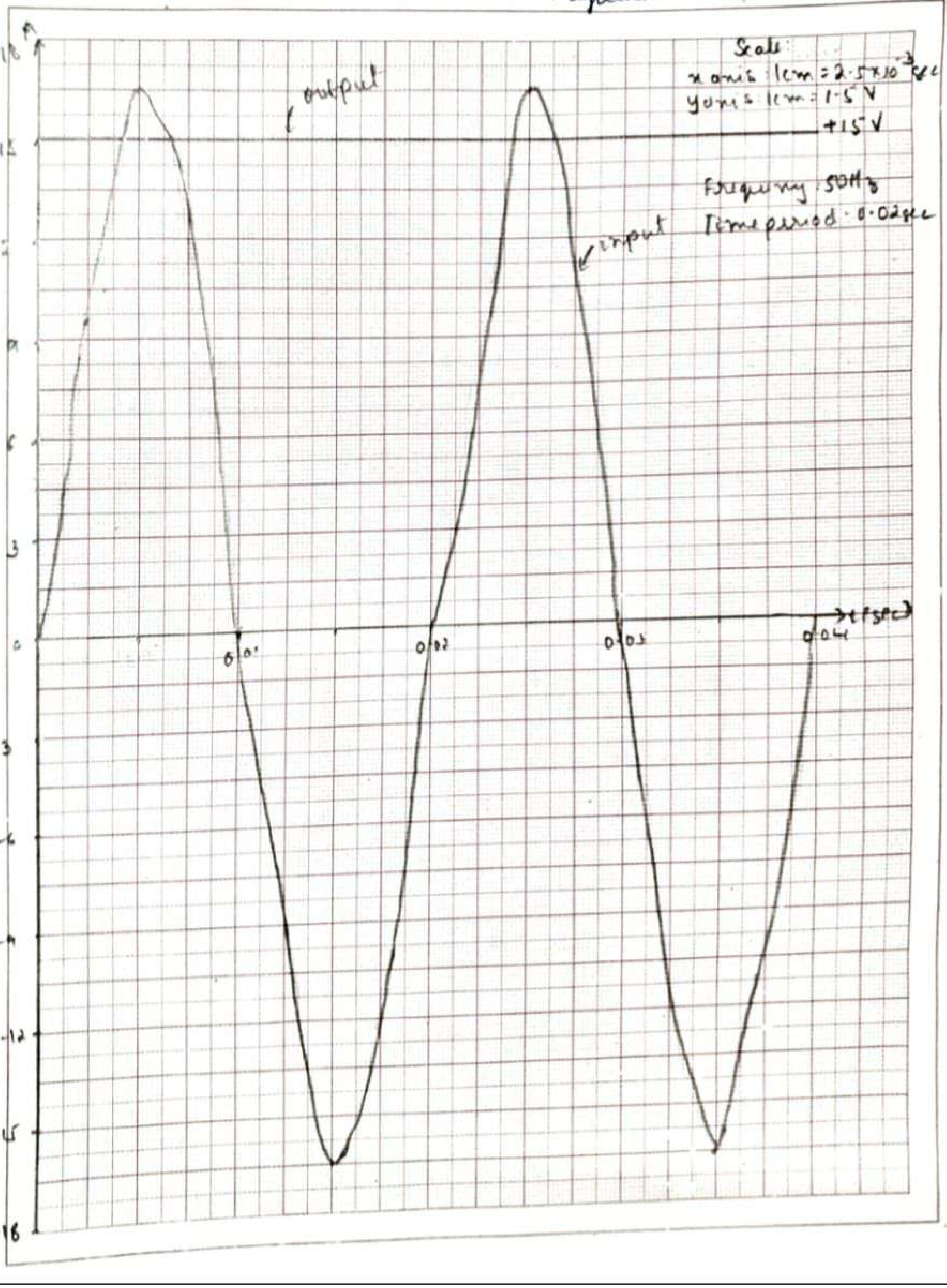
Experiment 10 - Half wave rectifier with function generator



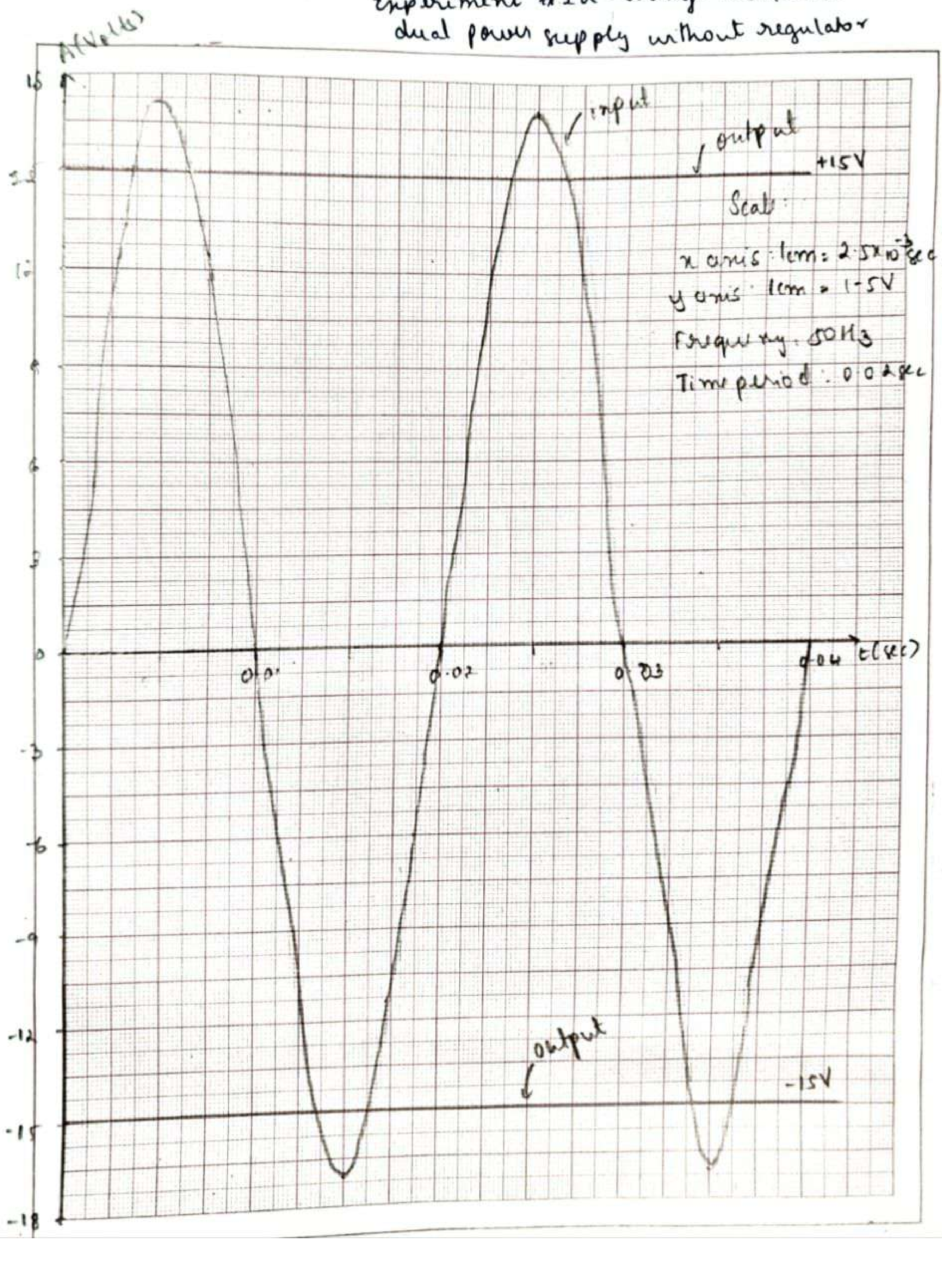
Experiment 1b - Bridge rectifier without regulator



Experiment 3.c - Bridge rectifier with regulator



Experiment #1d - Bridge rectifier as dual power supply without regulator



Experiment #12 - Bridge rectifier as a dual power supply with regulator