Experiment-3

Full Wave Rectifiers

1. Transformer Characterization

   Schematic circuit:

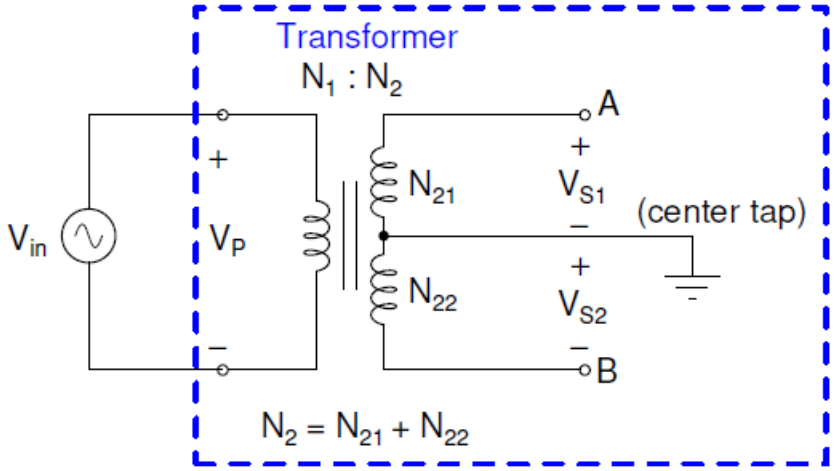
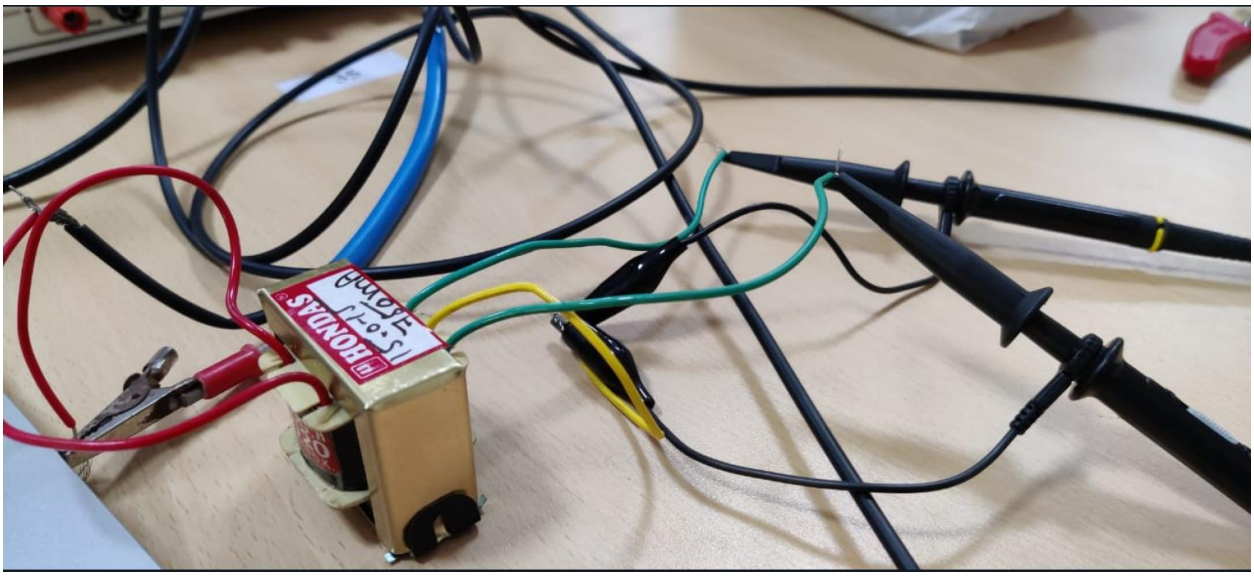
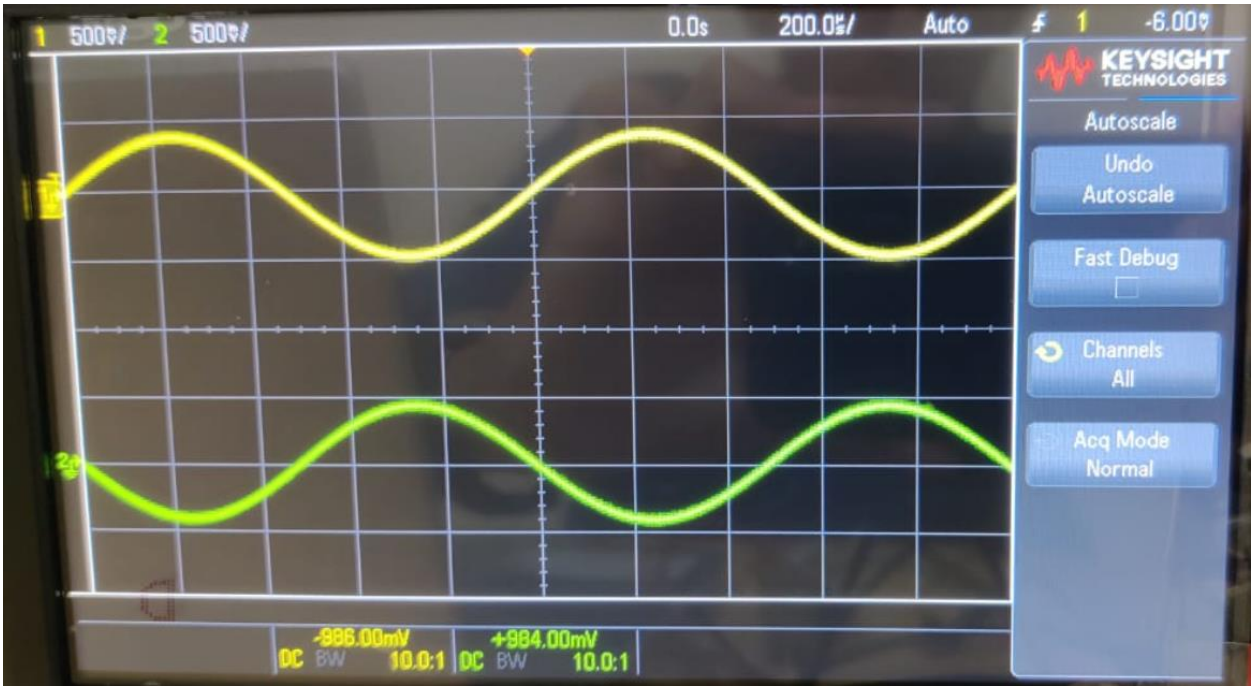


Figure 1: Bridge Rectifier

Circuit:



(b) Plotting and noting amplitude and phase difference between V_A and V_B:



$V_A \rightarrow$ Amplitude $\rightarrow$ 460 mV, ϕ = same as input wave.

And

$V_B \rightarrow$ Amplitude $\rightarrow$ 460 mV, $\phi = -180° + (\phi)$ input

$\therefore$ frequency = 1KHz

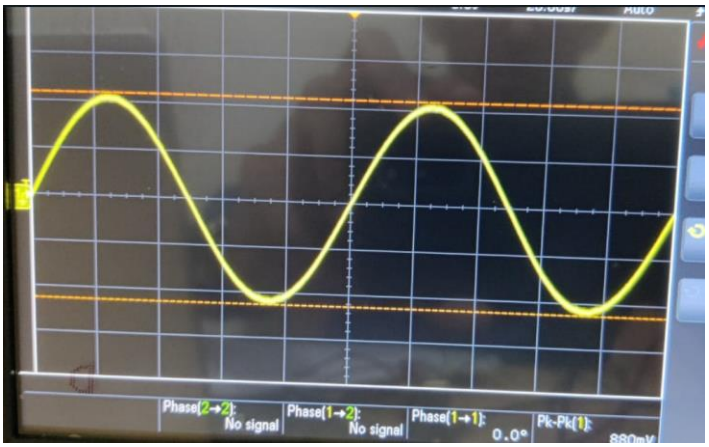
b) Amplitude : $V_A = V_B$ ($\because N_1 = N_2$)

c) ϕ (phase) $\Rightarrow$ $\phi_A - \phi_B = 180°$

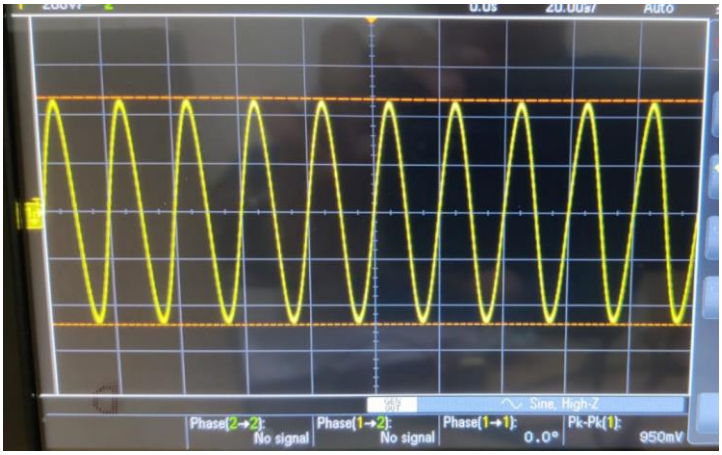
c)

Input frequency	Amplitude (VA)
1KHz	460mV
10KHz	440mV.
50KHz	470 mV
100KHz	0.635V
1MHz	0.645 V
5MHz	320mV
10MHz	220mV
20MHz.	180mV.

1-> 10 KHz:

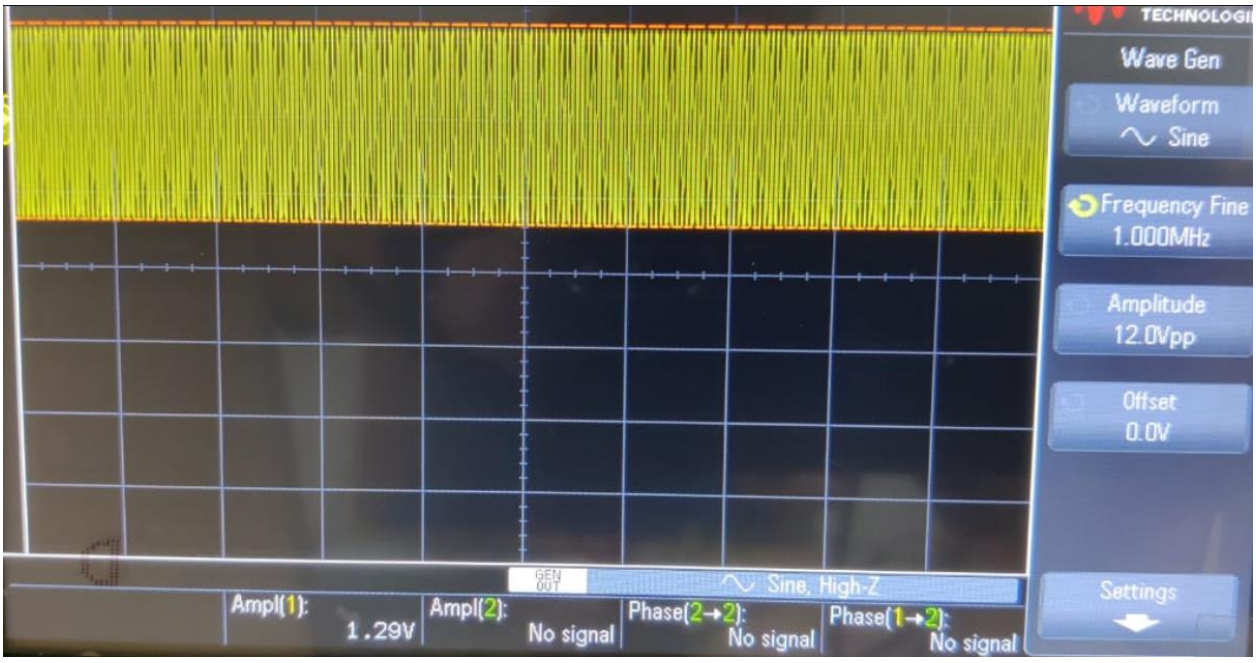


2->50 KHz:



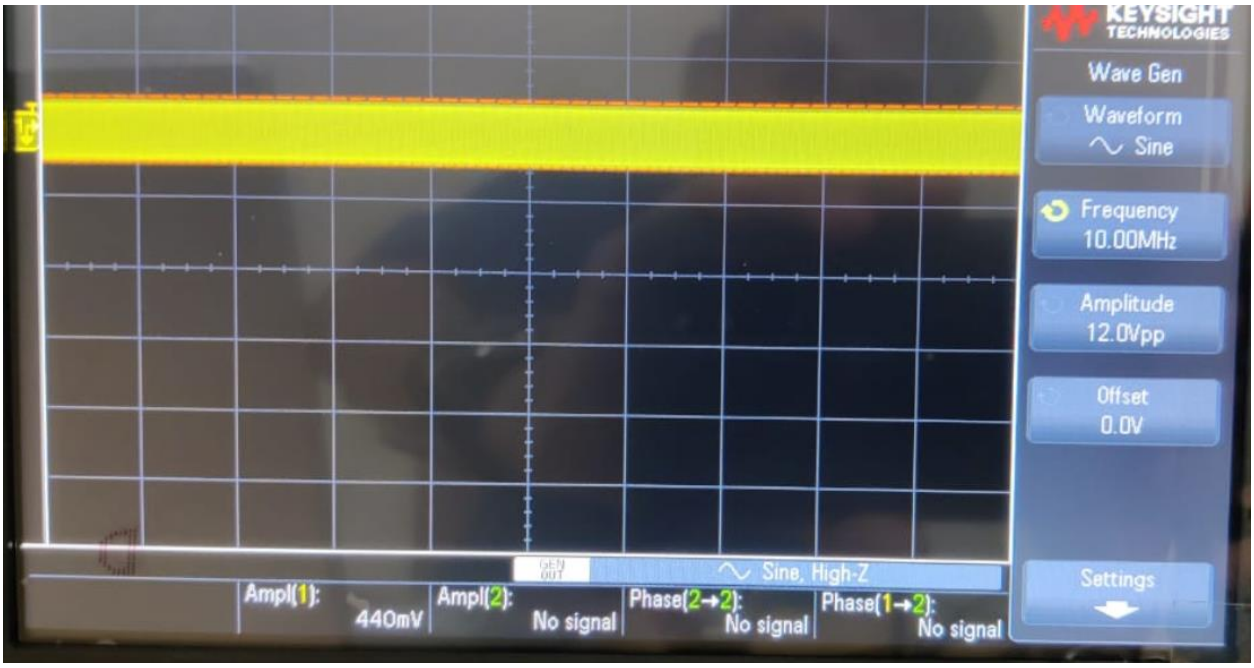
3->100kHz

4->1Mhz

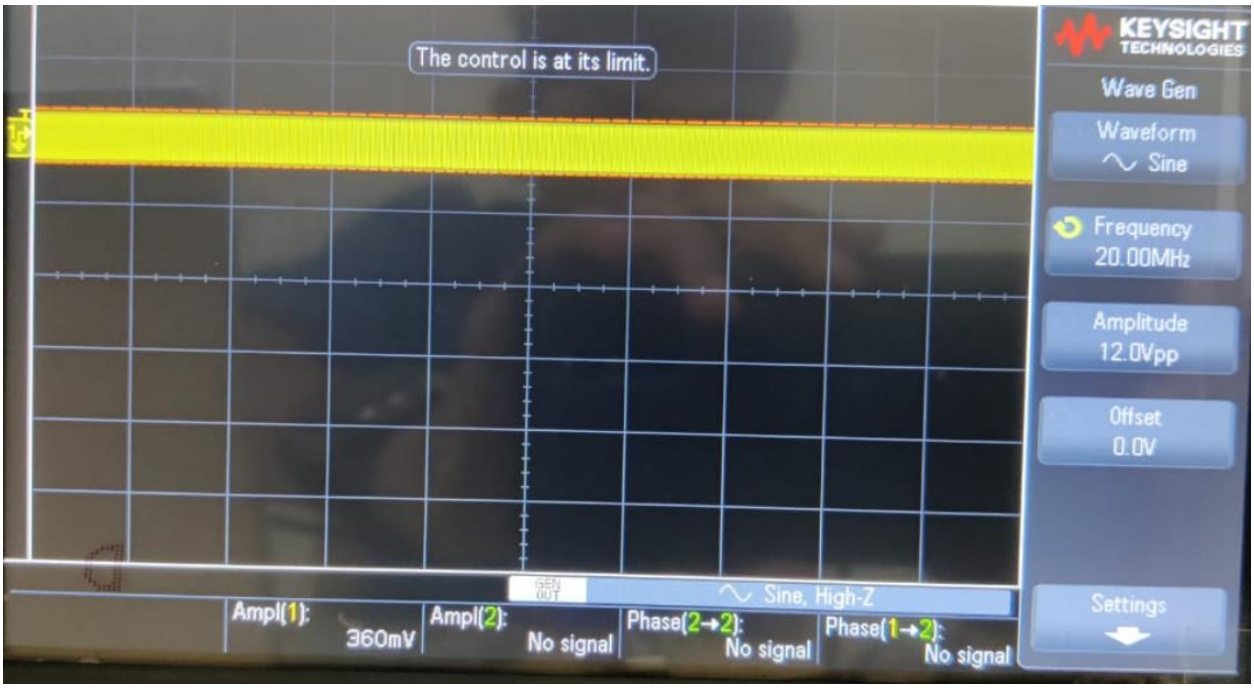


5->5MHz

6->10Khz



7->20Mhz



(d) OBservation:→

At first the output amplitude increases till 1MHz and then significantly decreases.

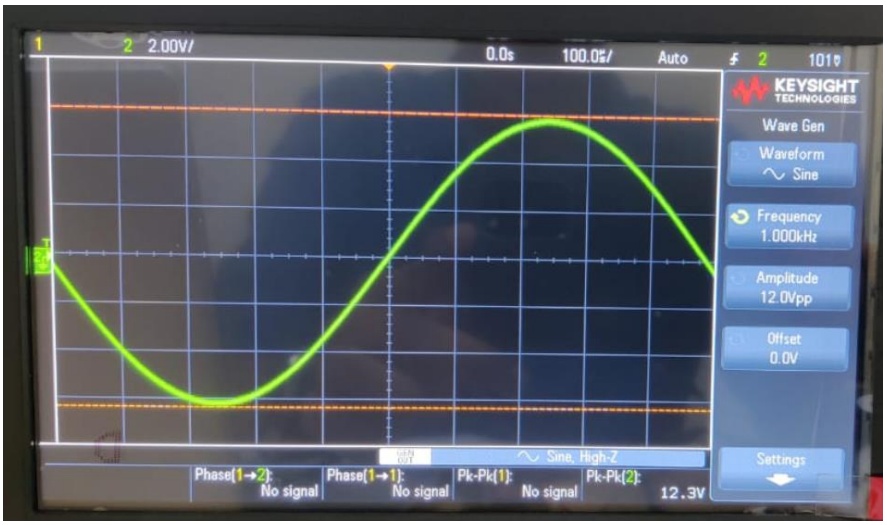
Reason: On increasing the frequency, the bandwith of the input cable is passed, After passing this frequency, there would be attenuation in the input signal.

Frequency	Vp (~~Amplitude~~ Vpeak-peak)
1 KHz	12.3V
10 KHz	12.1V
50 KHz	12.1V
100 KHz	12.3V
1 MHz	12.2V
5 MHz	12.2V
10 MHz	12.3V
20 MHz	12.2V

In my experiment the Amplitude of Vp doesn't gets decreased ∴ No reduction in input side.

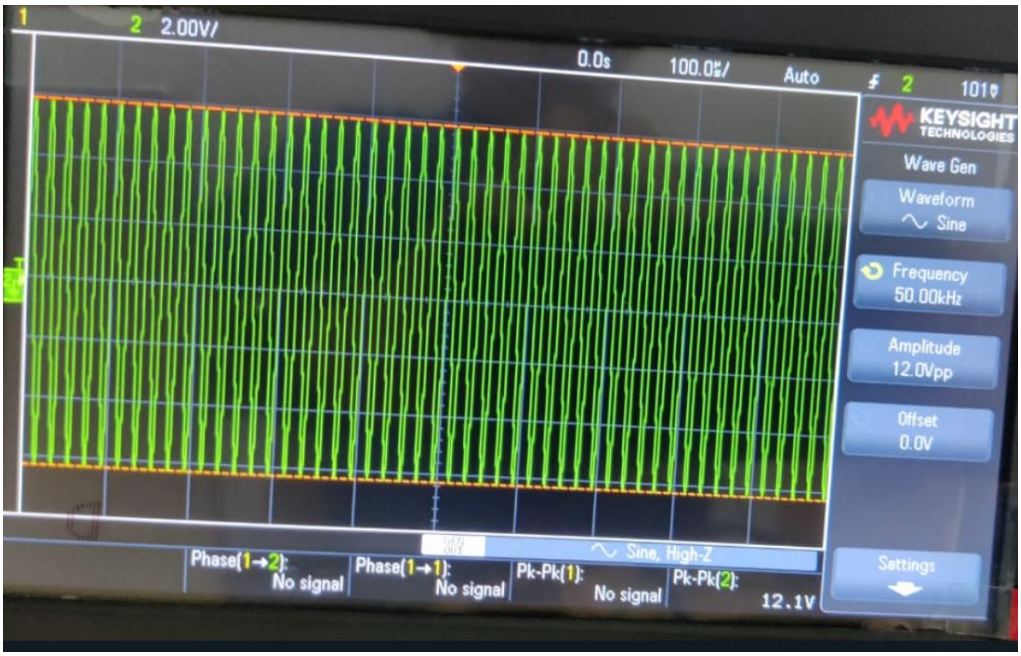
Plots of Vp varying with frequency:

1->1KHz

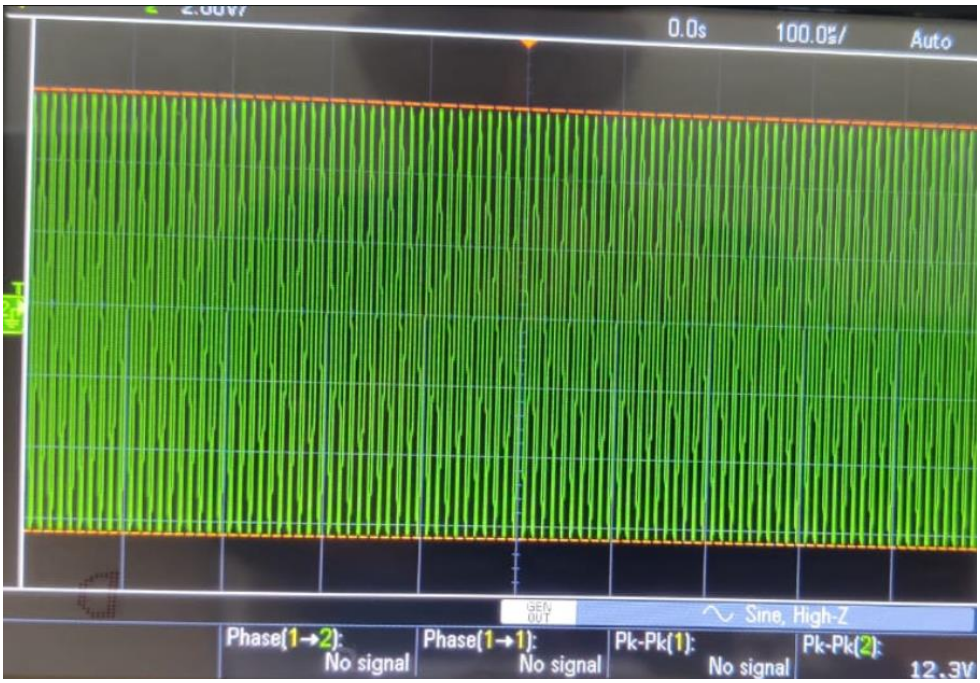


2->10KHz

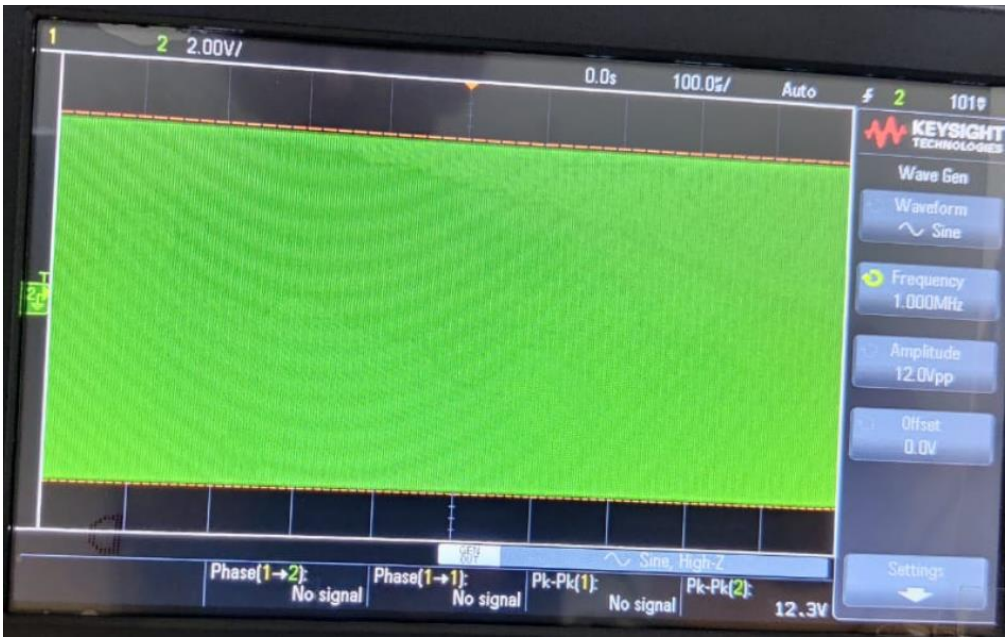
3->50KHz:



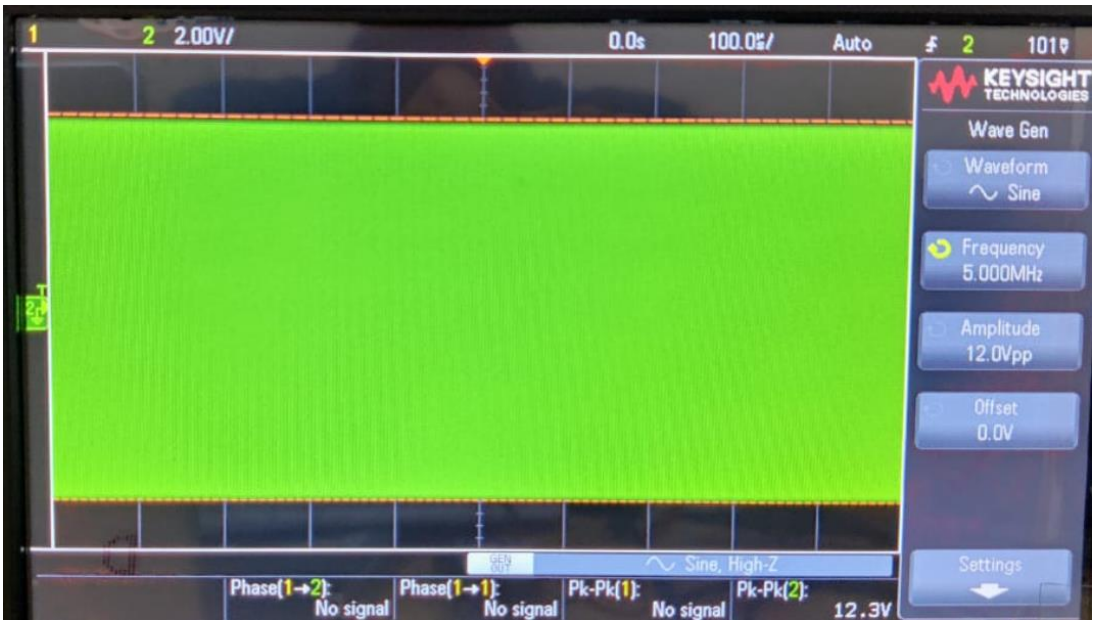
4->100KHz



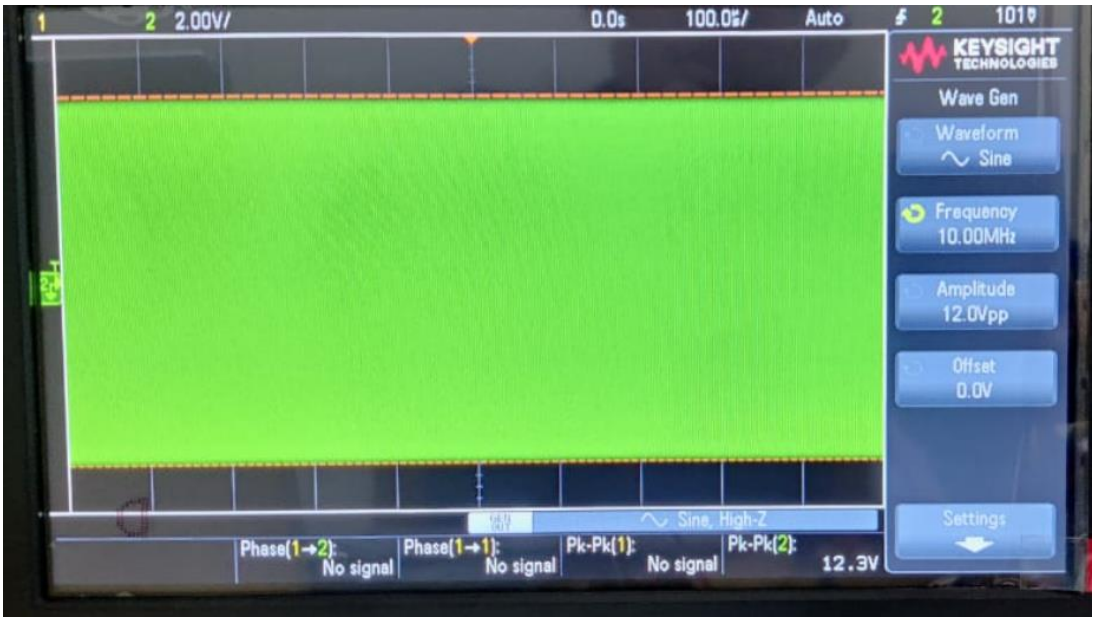
5->1MHz



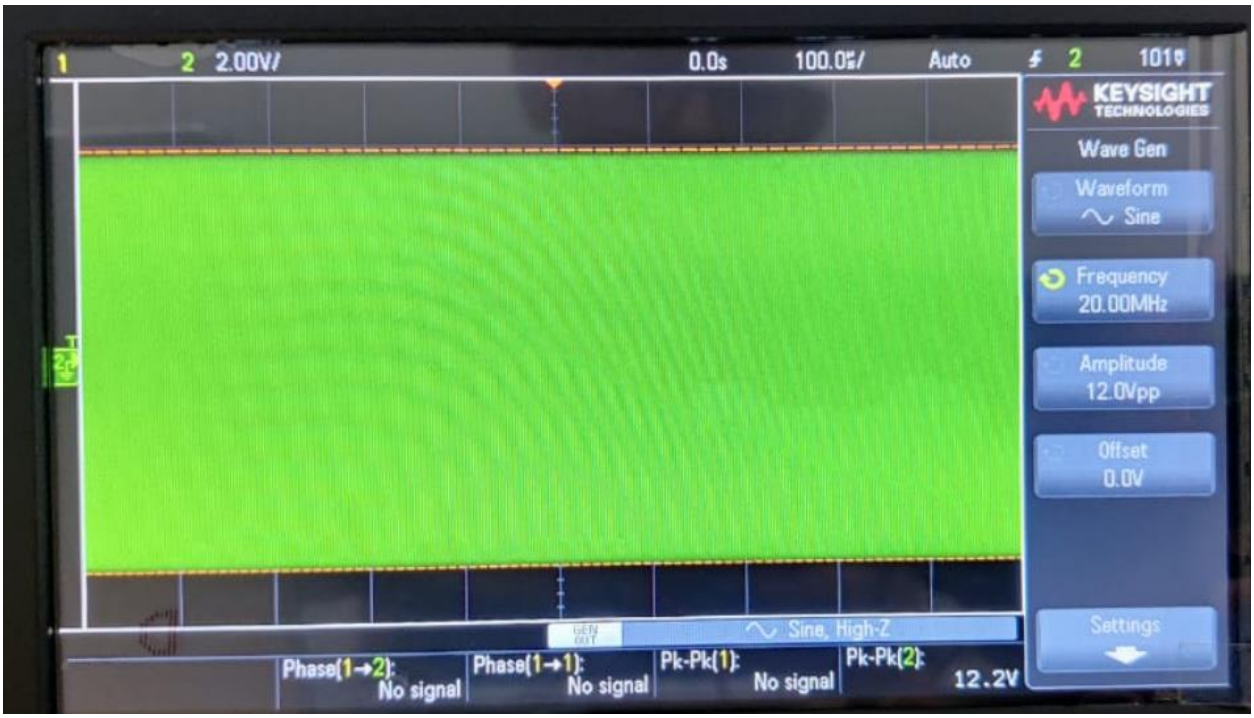
6->5MHz



7->10MHz



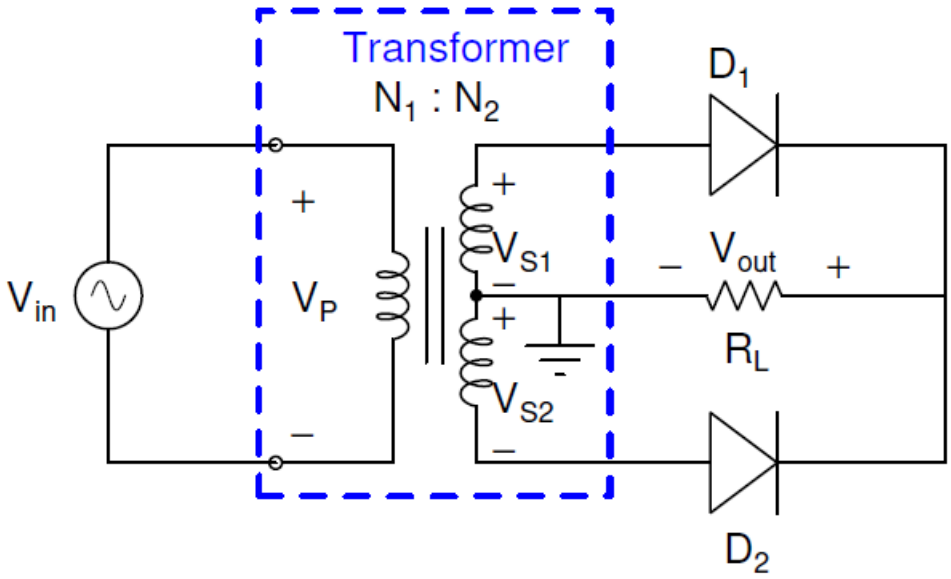
8->20MHz



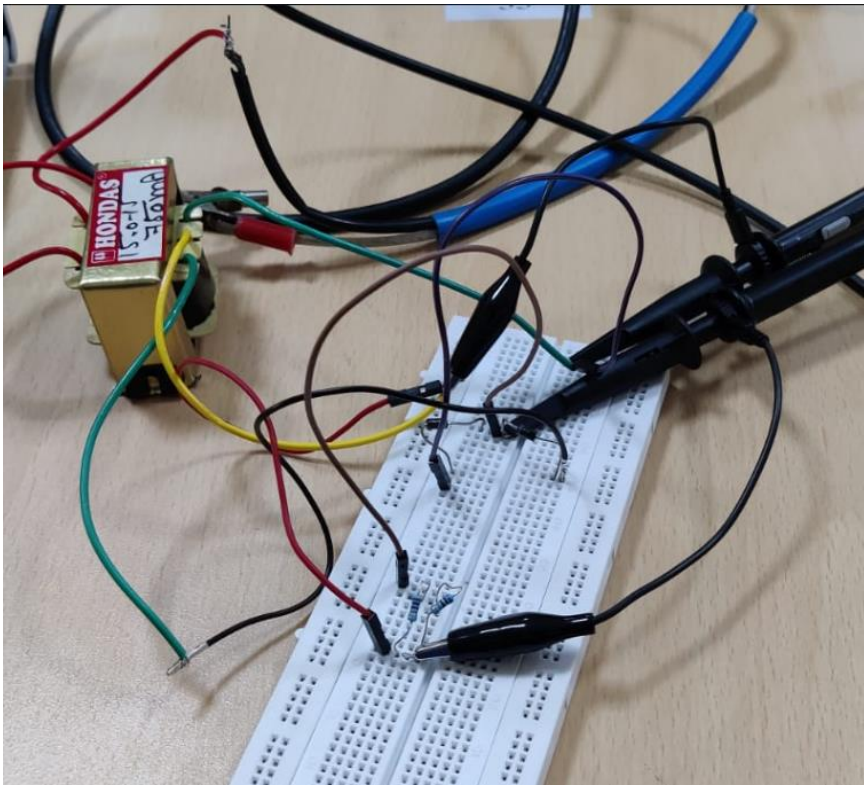
(e) As my V_{pp} is stable to 12.2V, there is n't any attenuation or decrease in frequency, therefore there doesn't exist a -3dB frequency for function generators output.

2. Full Wave Rectifier (FWR) using center tap transformer and two diodes

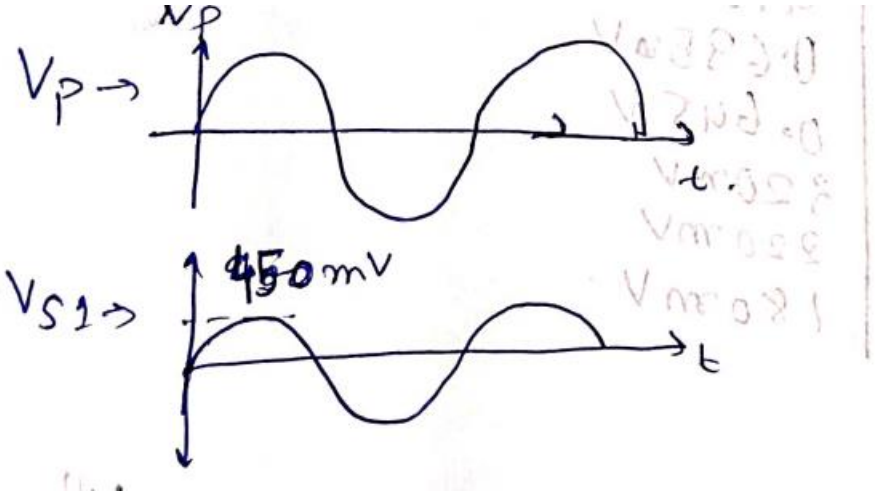
Schematic circuit:



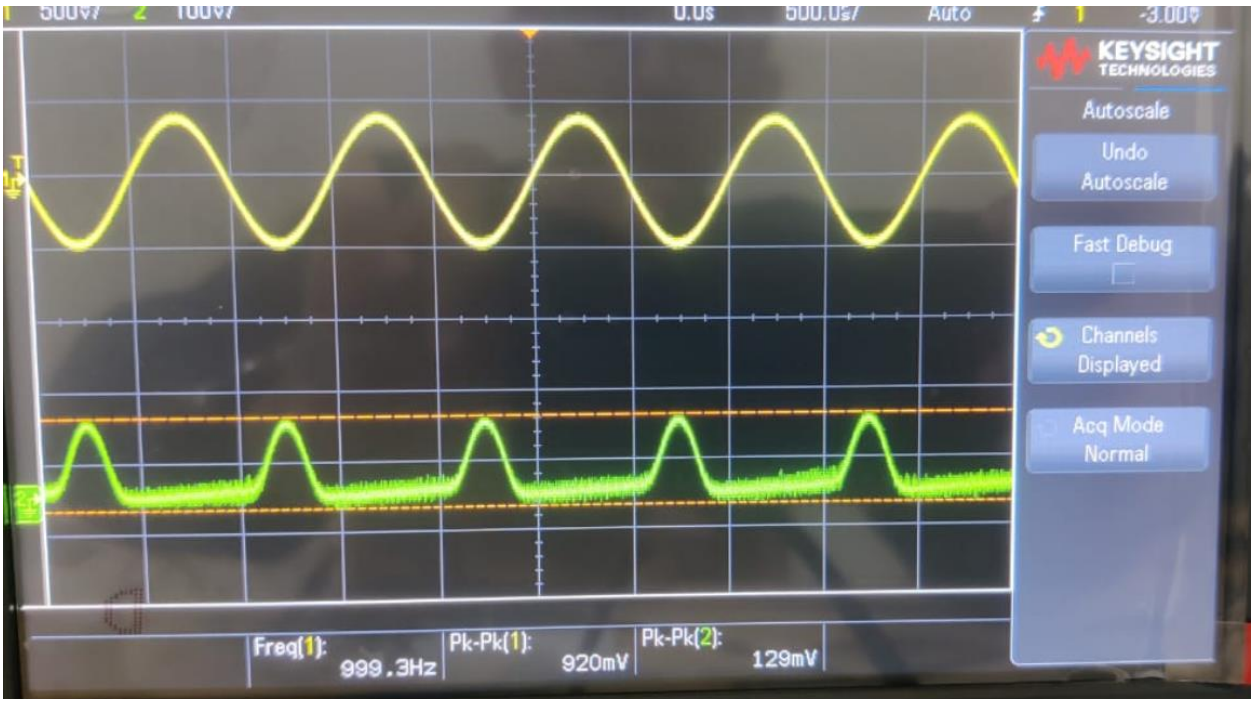
Circuit:



(b)



Vout:



Amplitude: Vs1 = 460mV.

Vout = 65 mV.

My circuit is not giving full wave rectified output. The output is half wave rectified thought. I have checked all the connections, and also replace the diodes, but the graph is still half wave rectified.

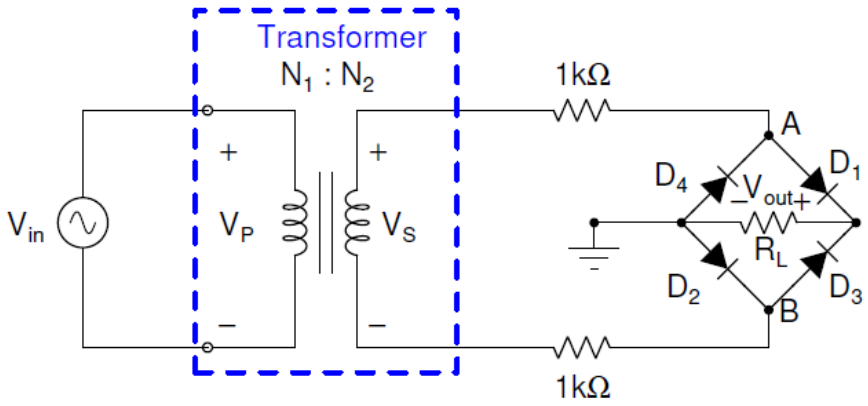
(C) Ipeak = 65mV/50 Kohm = 1.29 uA.

(d) Yes Vout amplitude is significantly reduced, The Reason is as the current is of uA range (0.5 uA) the diode is not completely in conduction mode, hence it doesn't allow much current so potential drop across R_L is very small.

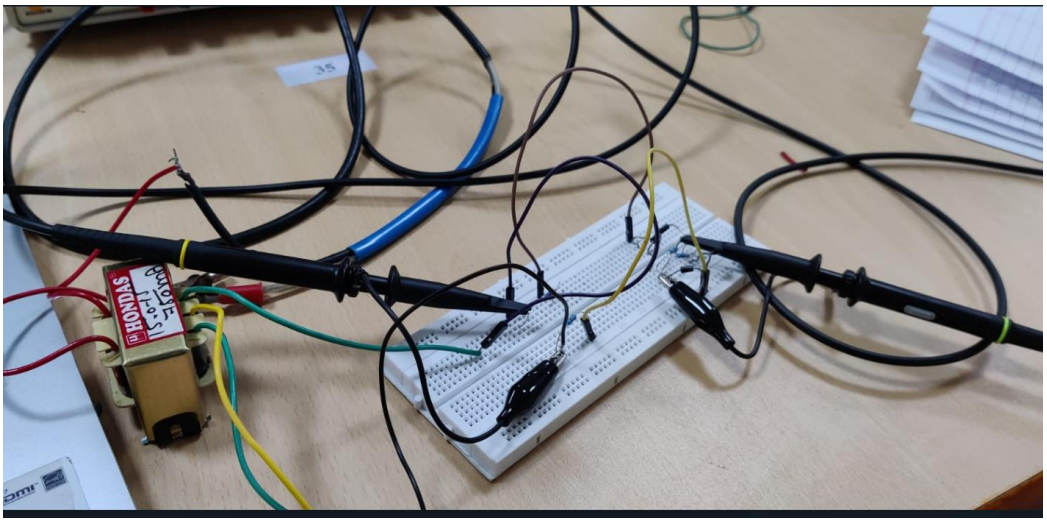
3. Bridge rectifier for full wave rectification

   Part A)

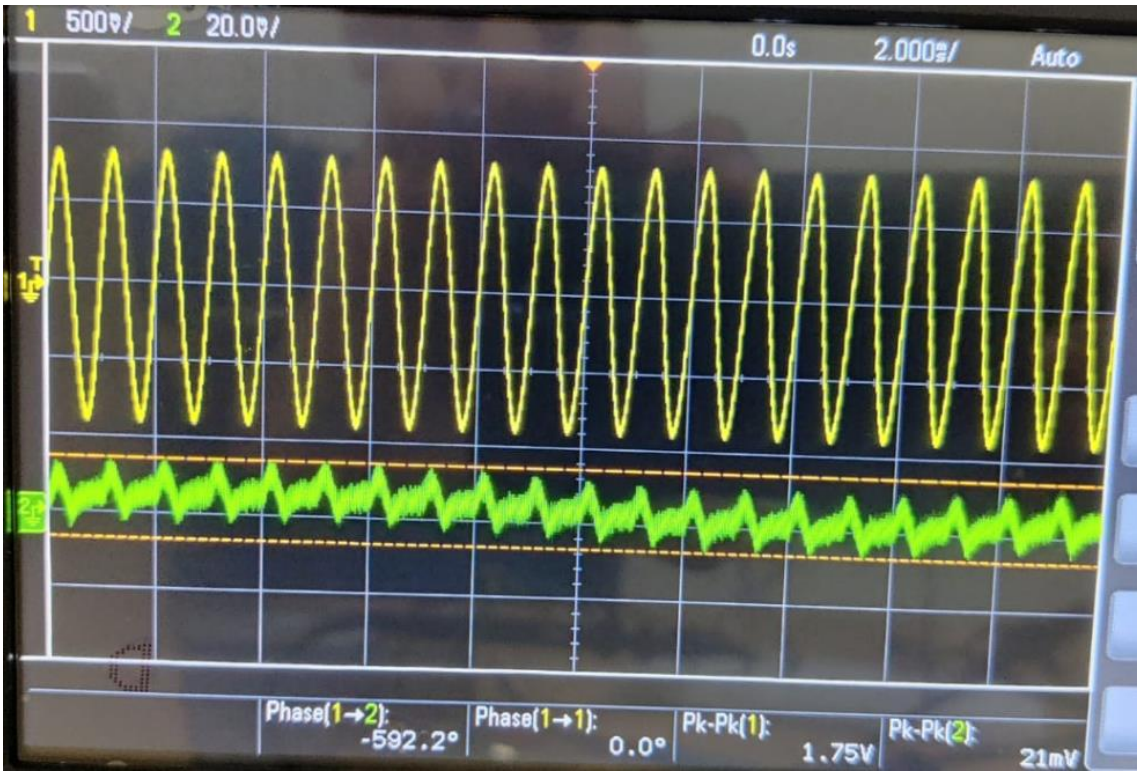
   Circuit:



Circuit:



Plotting Vs and Vout for the above circuit((Vpp)in =12V and frequency: 50KHz):

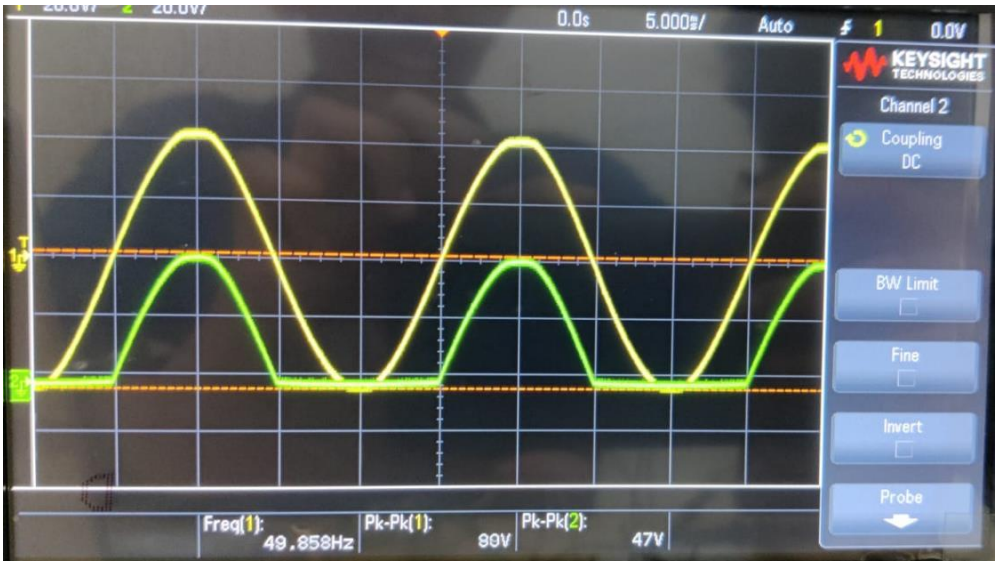


Vs ->Vpp value-> 1.75 v

Vout->Vpp value->21mV

I peak: 21mv/50Kohm = 0.42uAmphre

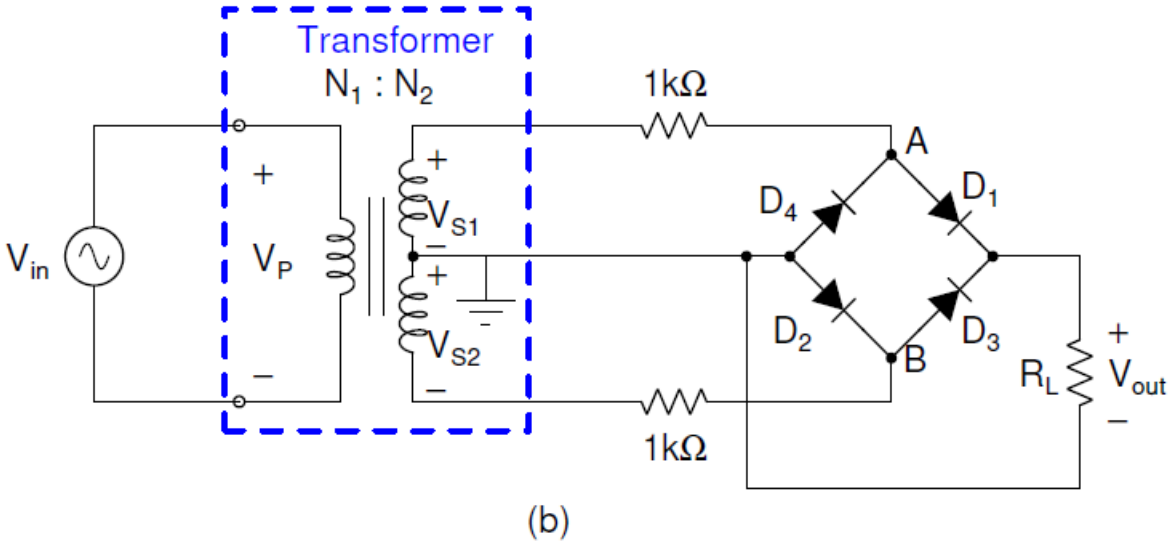
(d) Yes Vout amplitude is significantly reduced, The Reason is as the current is of uA range (0.5uA) the diode is not completely in conduction mode, hence it doesn't allow much current so potentiall drop across R_L is very small.



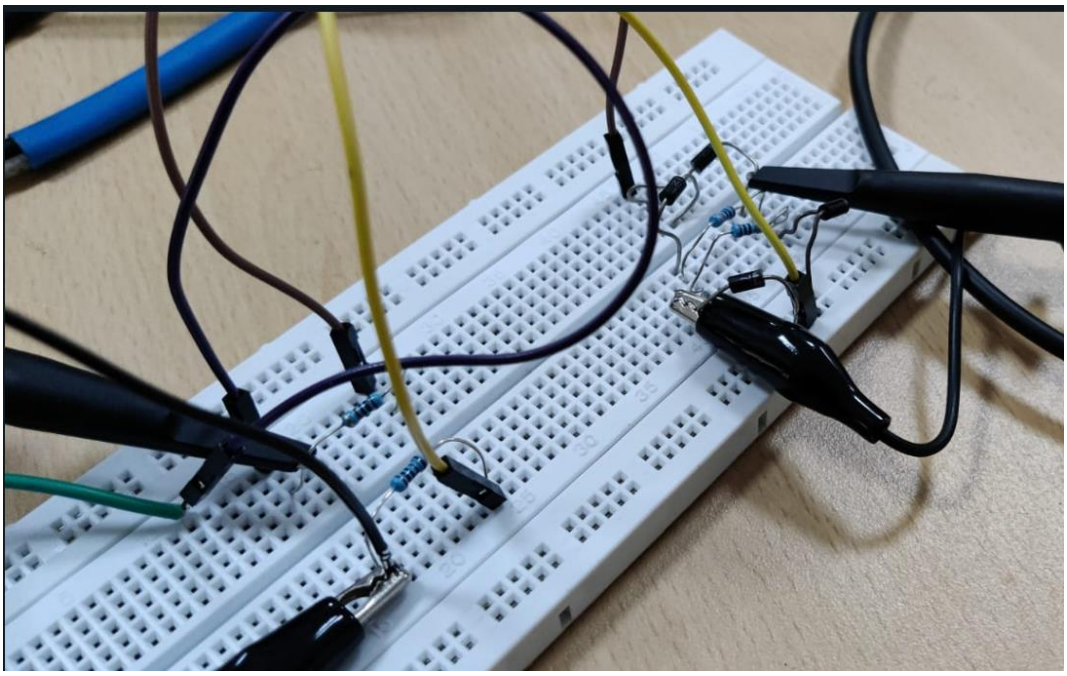
Plotting FWR output (V_{out}) for the wall supply:

Part B:

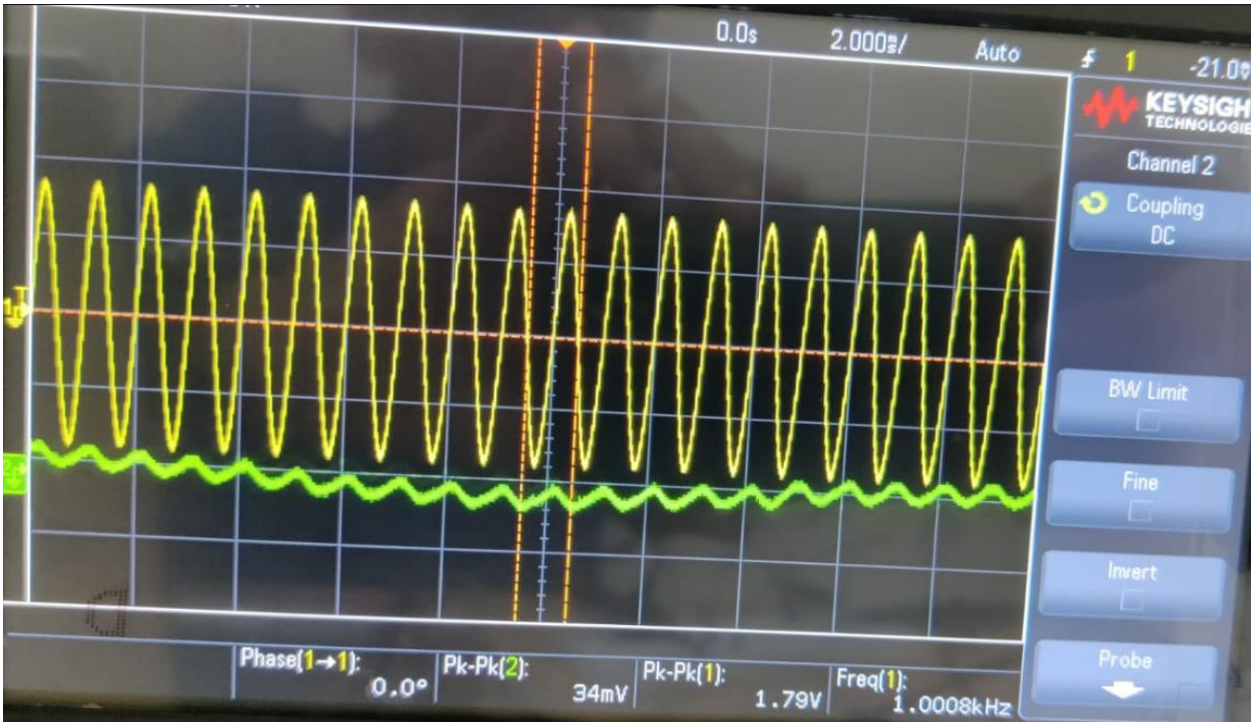
Schematic circuit:



(b)



Plotting Vs and Vout for the above circuit((Vpp)in =12V and frequency: 50KHz):

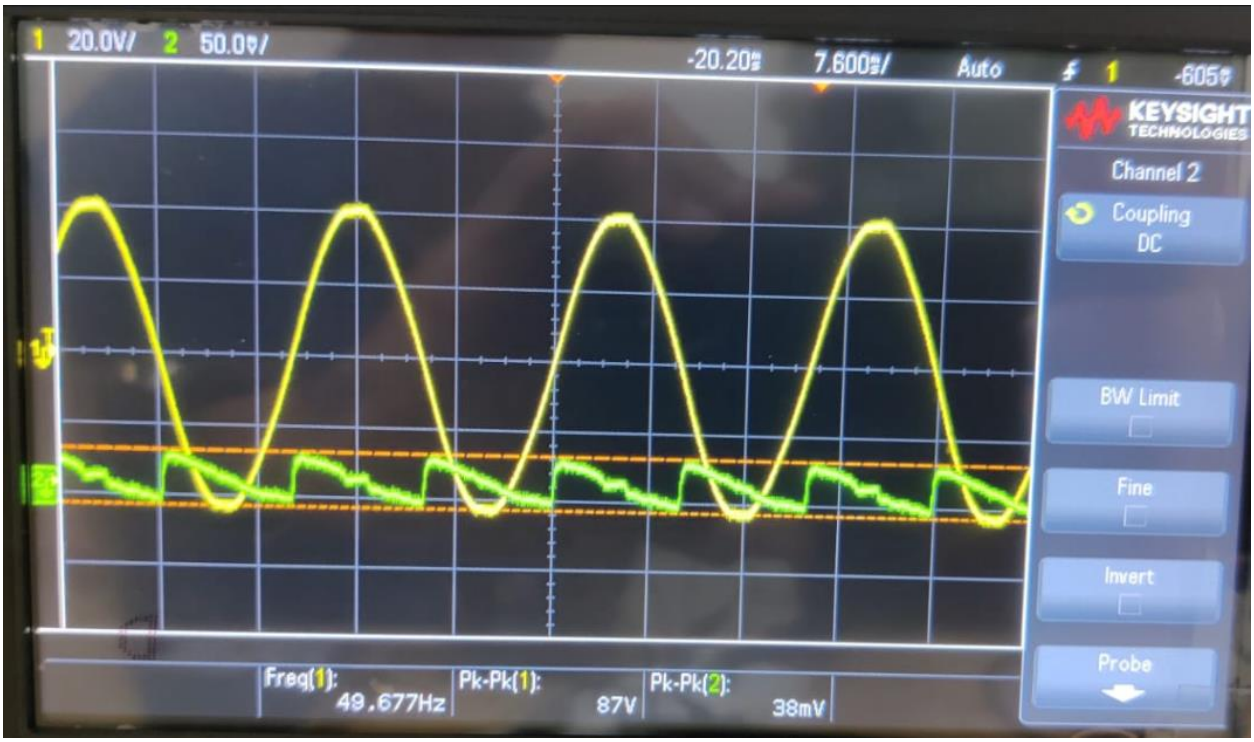


(b) $V_{S_1} \rightarrow V_{pp} \rightarrow 450\ mV$

$V_{R_L} = V_{pp} \rightarrow 17\ mV$.

→(c) $I_{peak} \Rightarrow \frac{17 \times 10^{-3}}{50 \times 10^{3}} \rightarrow \frac{17 \times 10^{-6}}{50} \rightarrow 0.34\ \mu A$

Replacing V_{in} with the wall supply and plotting FWR output (V_{out}) for the wall supply:



We observe better signal levels at V_{out} as compared to the previous case when function generator was used as input source because the Voltage at secondary source is much higher than with Function generator, with function generator the peak-to-peak value was 900mv whereas here it is 87V, that is much higher and so the diodes conduct fully in forward bias condition. Hence, we get a clearer graph.