POWER SUPPLY CIRCUIT

Task 8

Task 8 **[Distinction criteria: D2]**

Analyse the operation and the effects of varying component parameters of a motor vehicle power supply circuit that includes at least a transformer, diode and a resistor. To achieve this task, complete either a or b below:

a) Build a basic simulation power supply (using Yenka / Multisim) to allow all the respective properties to be investigated without the hazards of damaging a vehicle's system. This could be achieved using a function generator, alternating voltage or variable power source, along with a small isolating transformer, diode rectifiers (half wave and bridge) and load resistors in circuits such as alternator applications, bulb failure warning systems or data input devices.

b) Build the circuit below in a simulator (using Yenka / Multisim)

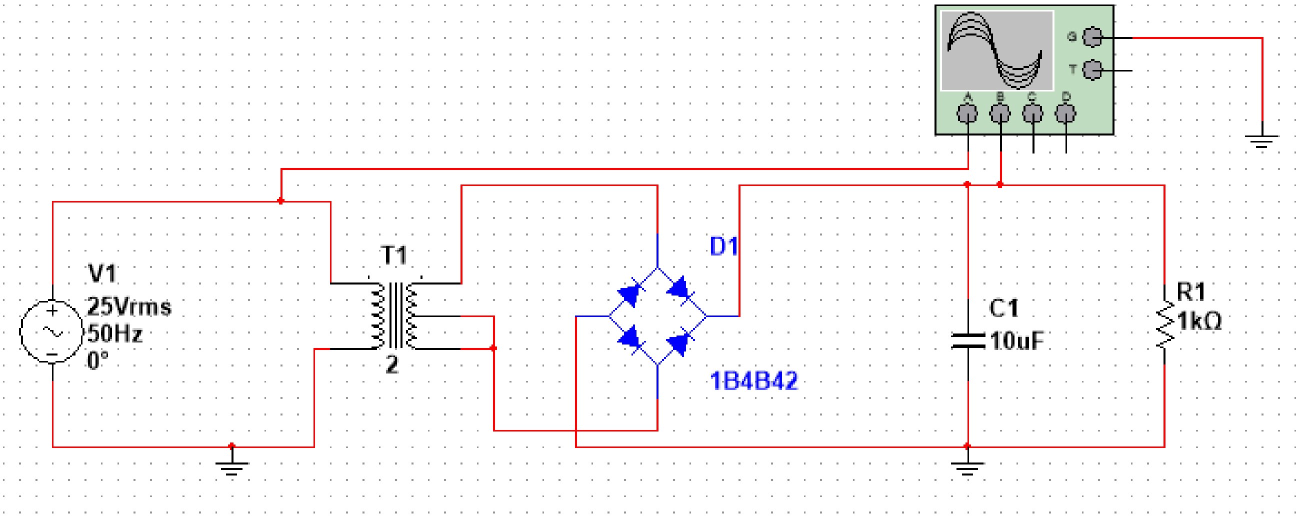


Figure 1: Power Supply Circuit AC to DC

and analyze the operation of the power supply circuit by varying the following parameters.

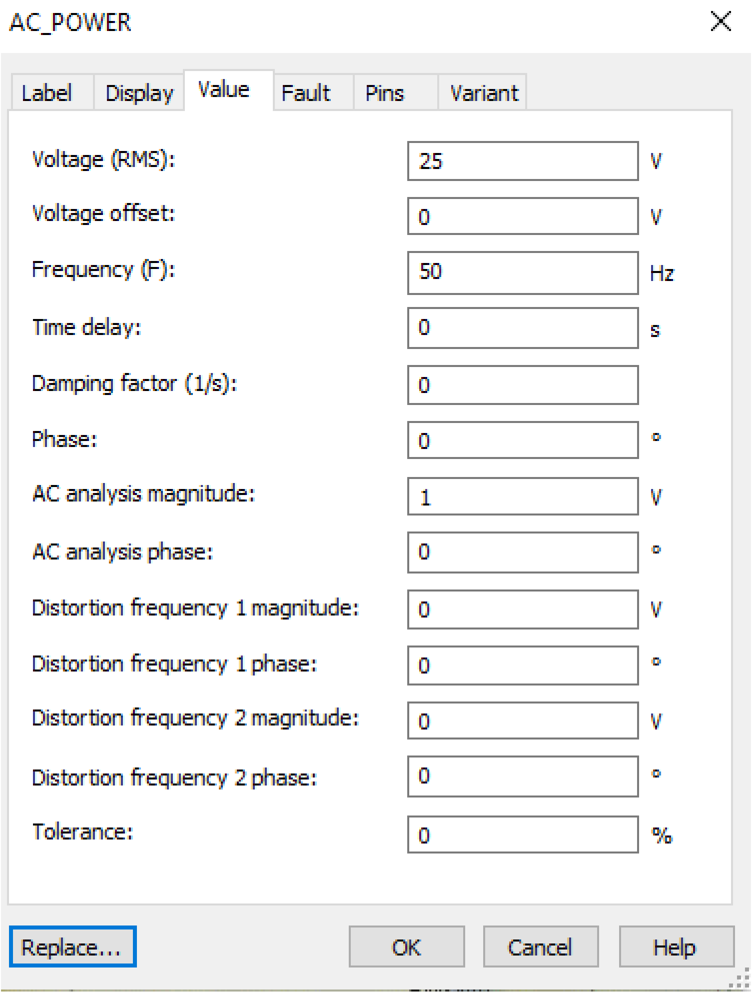


Figure 2: Input parameters of circuit

It is important you use the scaling functions on the oscilloscope to display 3-4 cyclesof the waveform, otherwise your oscilloscope captures may not display the waveforms clearly enough.

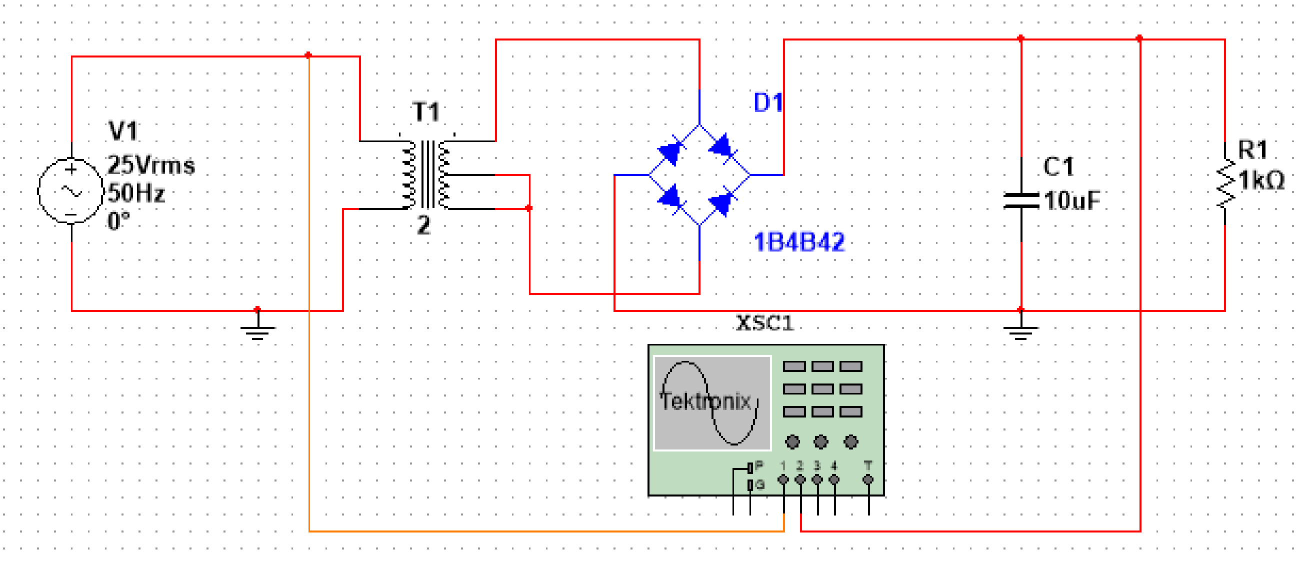


Figure 3: Oscilloscope at primary winding of channel 1 and channel 2 is at the output of Circuit

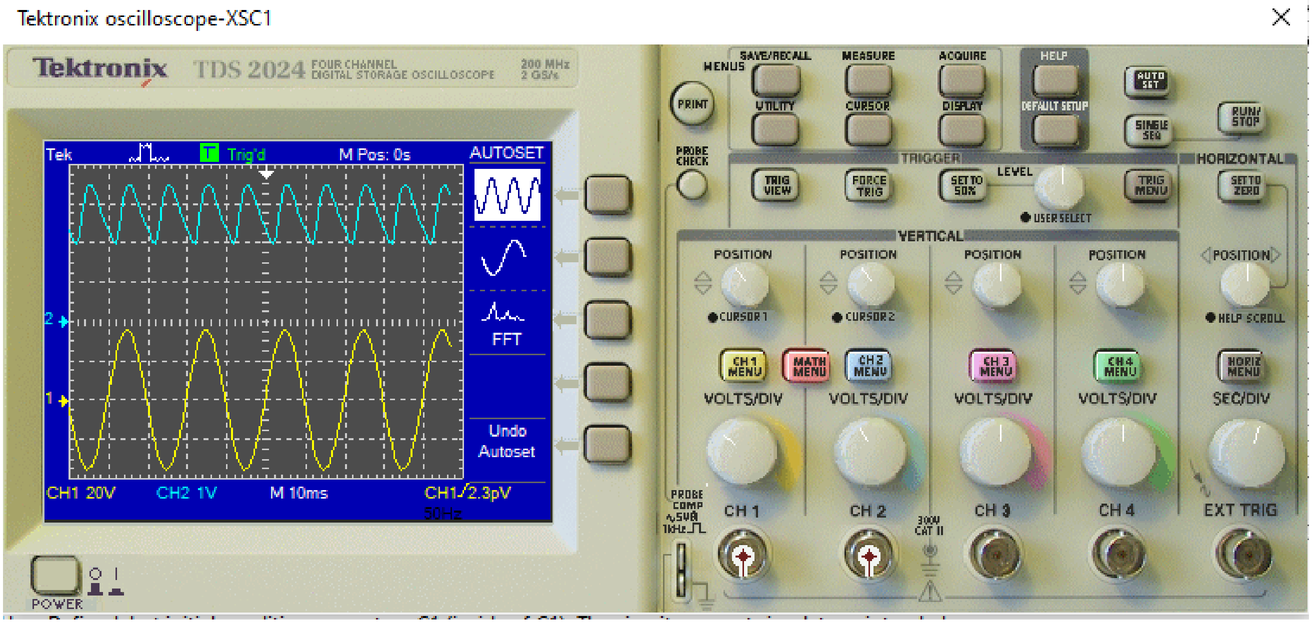


Figure 4: Used the scaling operation in the oscilloscope yellow wave is input and blue waveform having ripples is the rectified output

i. Use the oscilloscope to monitor the AC input voltage across the secondary windings of the transformer (ch.1) and also the dc output voltage (i.e. across R1 - ch.2).

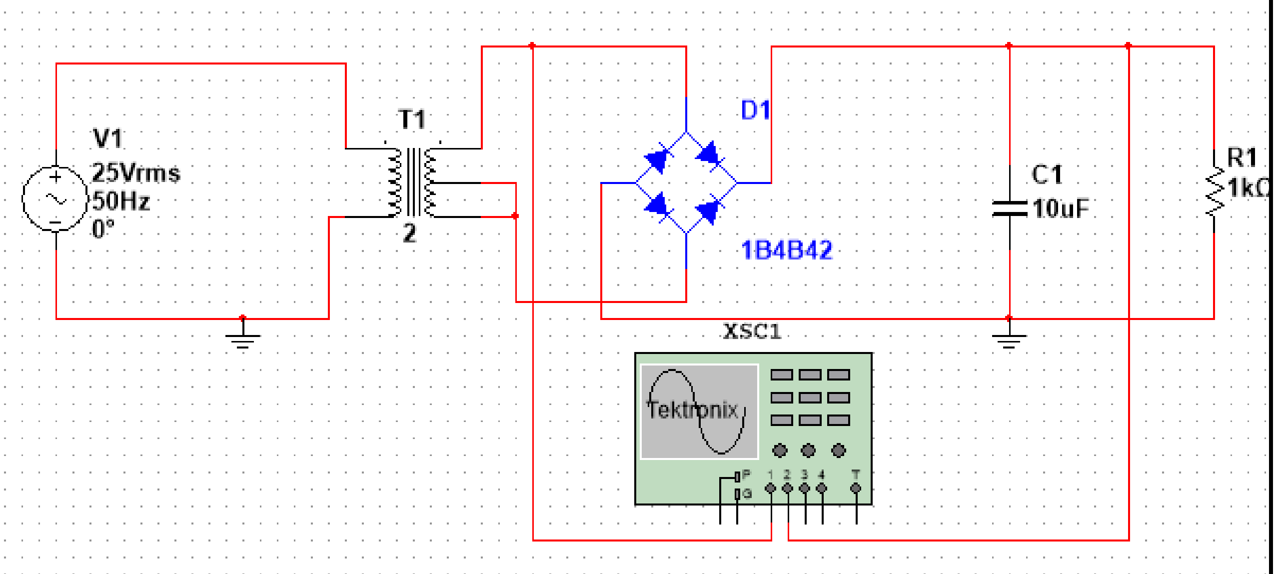


Figure 5: Now channel 1 is at the secondary winding of the transformer and channel 2 is connected with R1

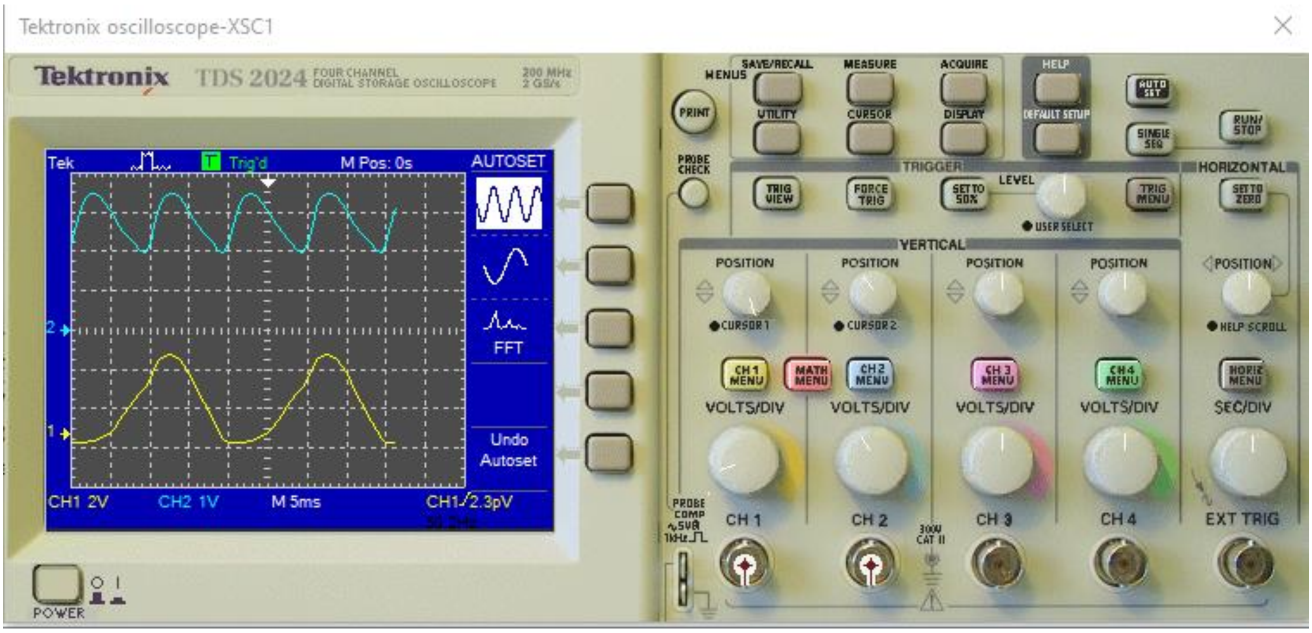
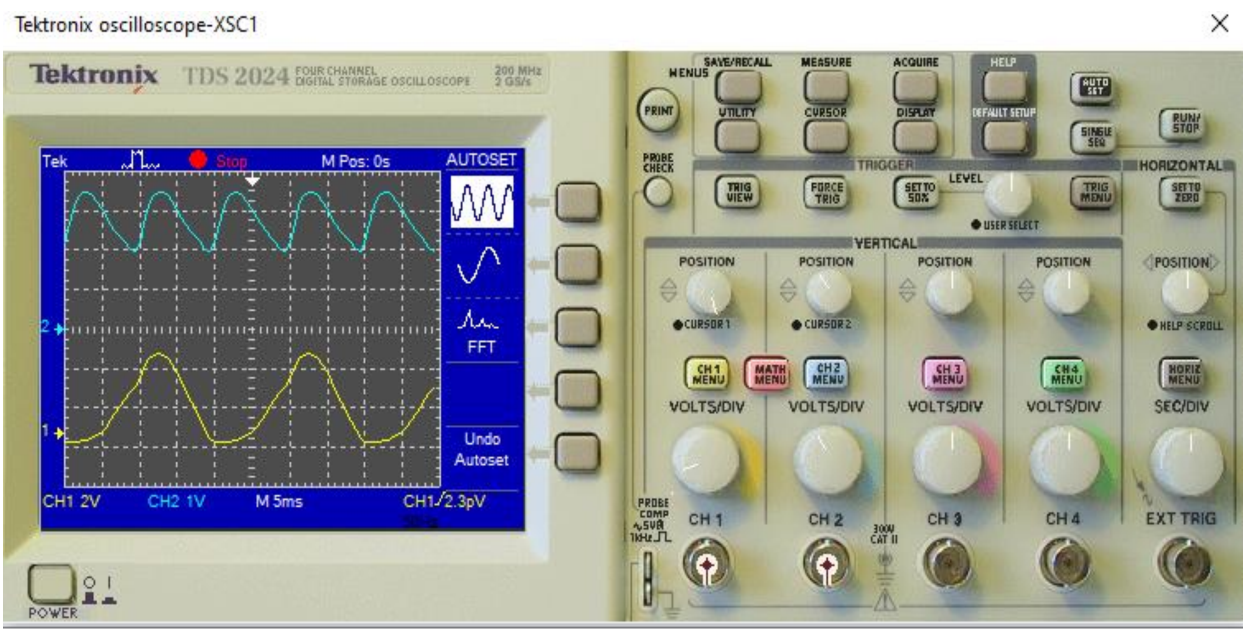


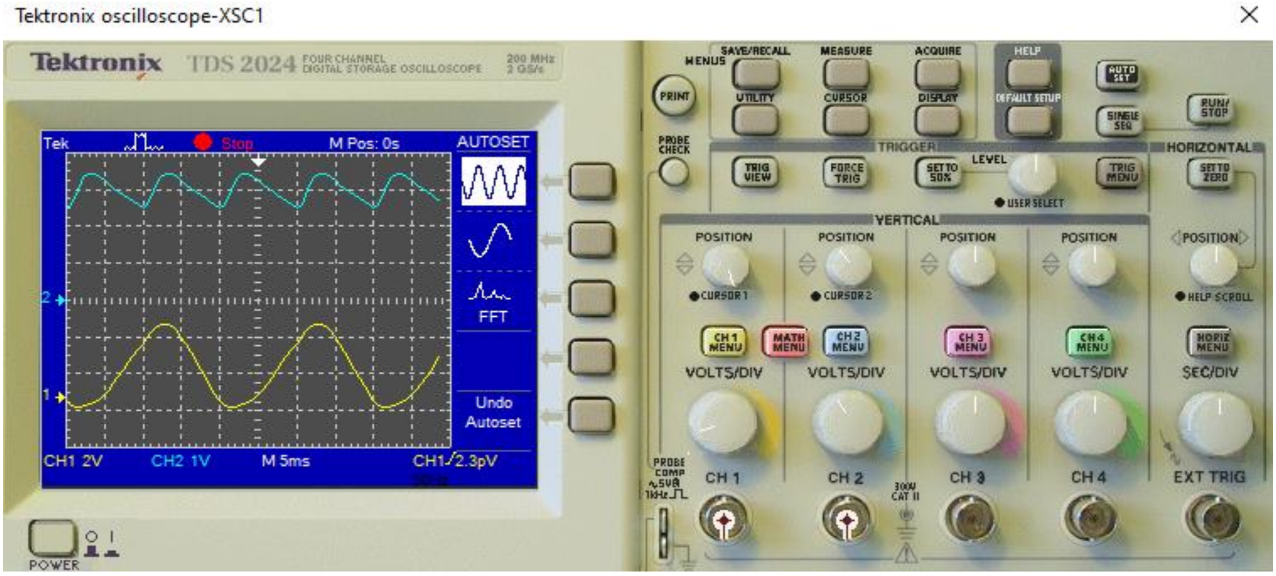
Figure 6: Input is 2V after secondary turns of transformer here the number of turn have not mentioned therefore I have used here default turns changing turns change the voltage at the output of transformer

c) Change C1 from 10uF to 100uF in steps of 10uF and print-screen the two input and output waveforms. Use these to provide an explanation of what is happening and why.

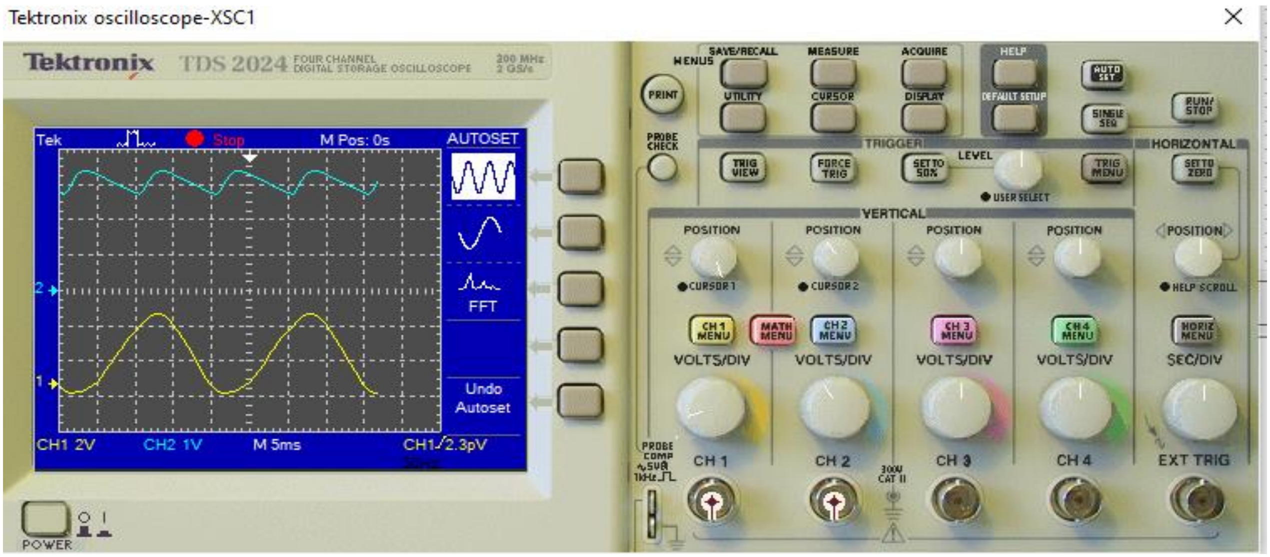
At 10uF



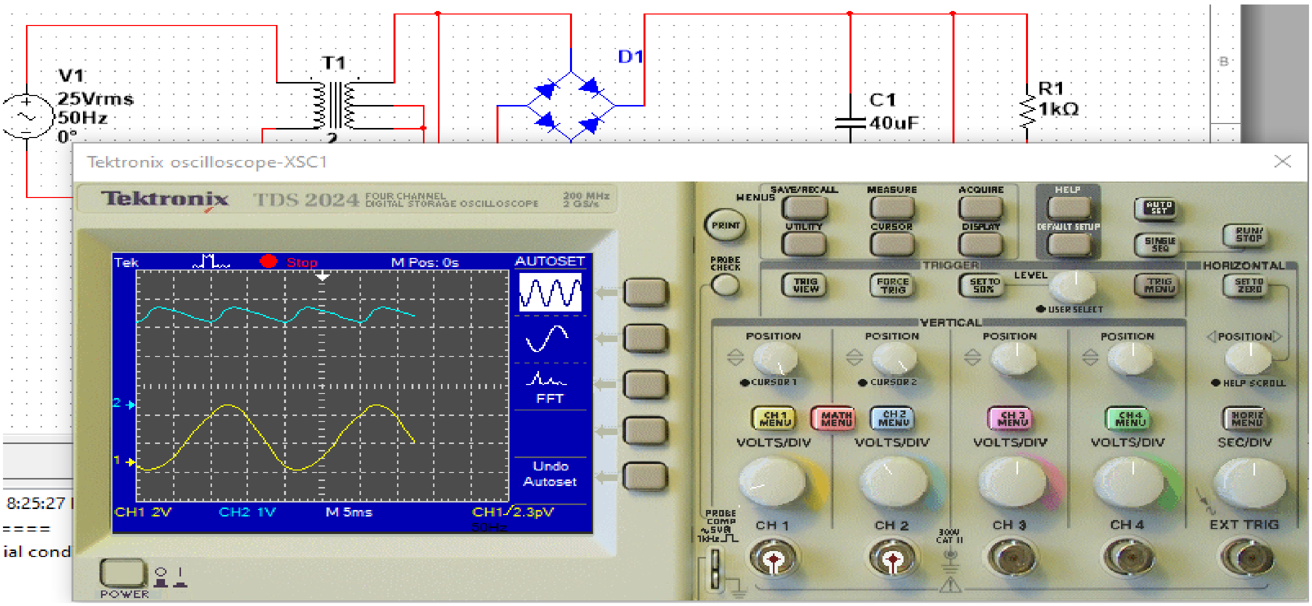
20uF



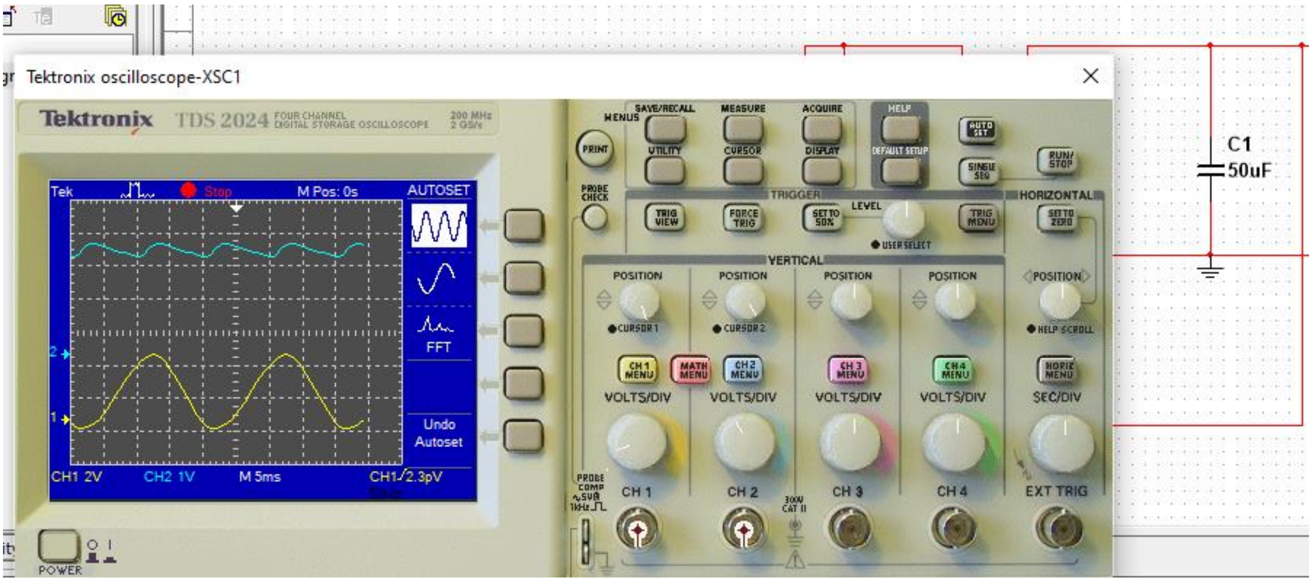
30uF



40uF

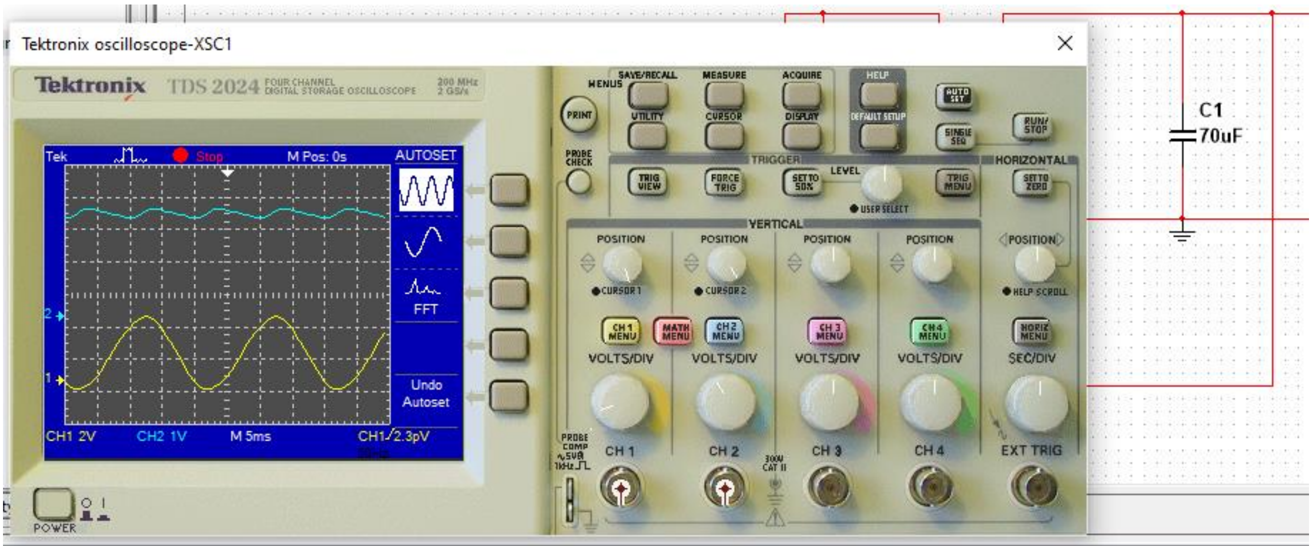


50uF

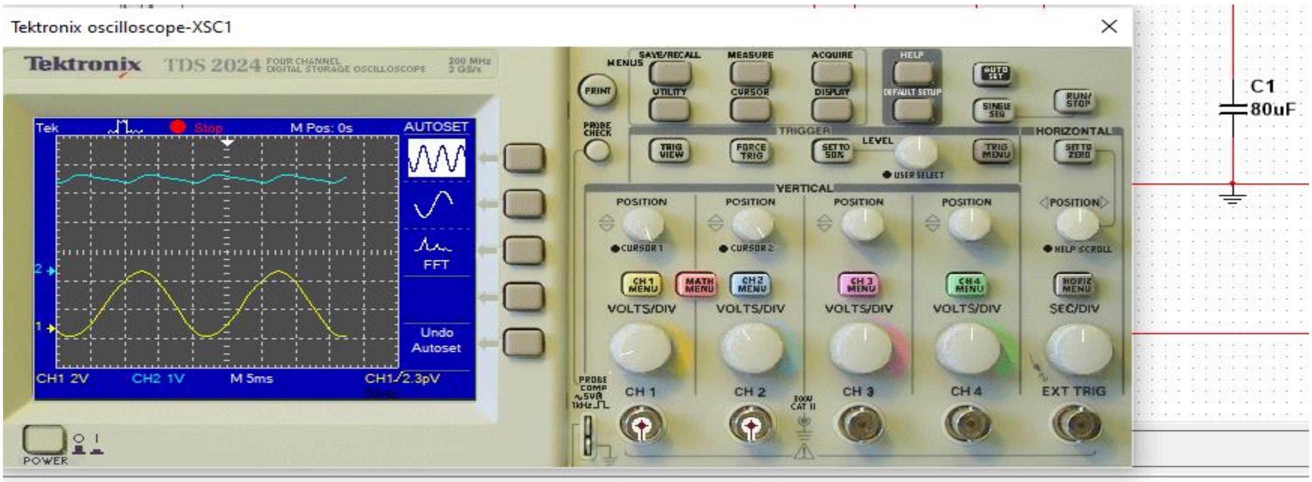


60uF

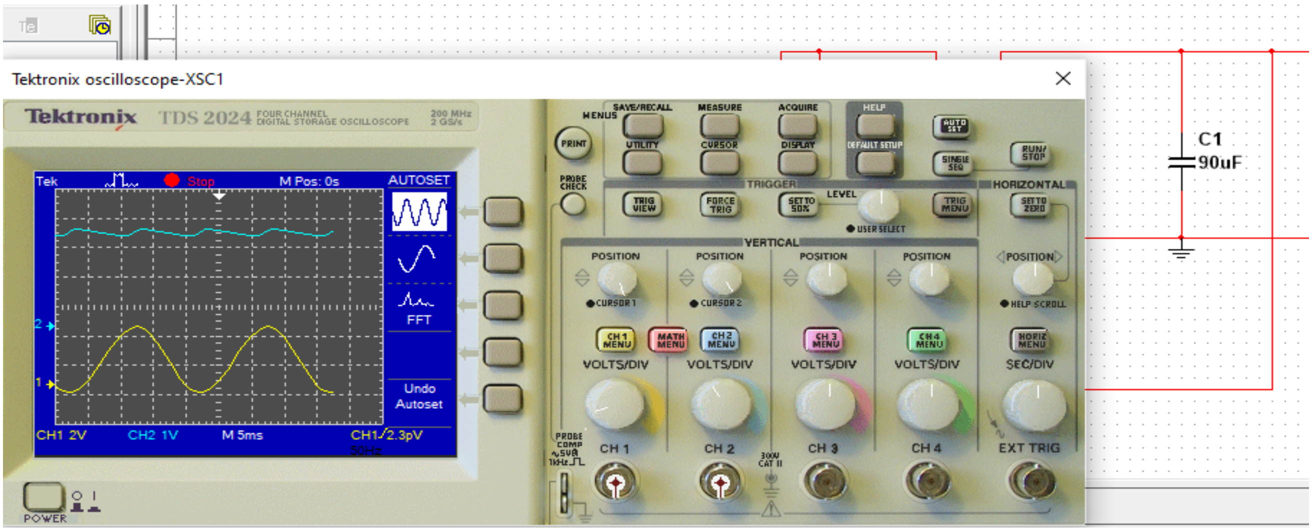
70uF



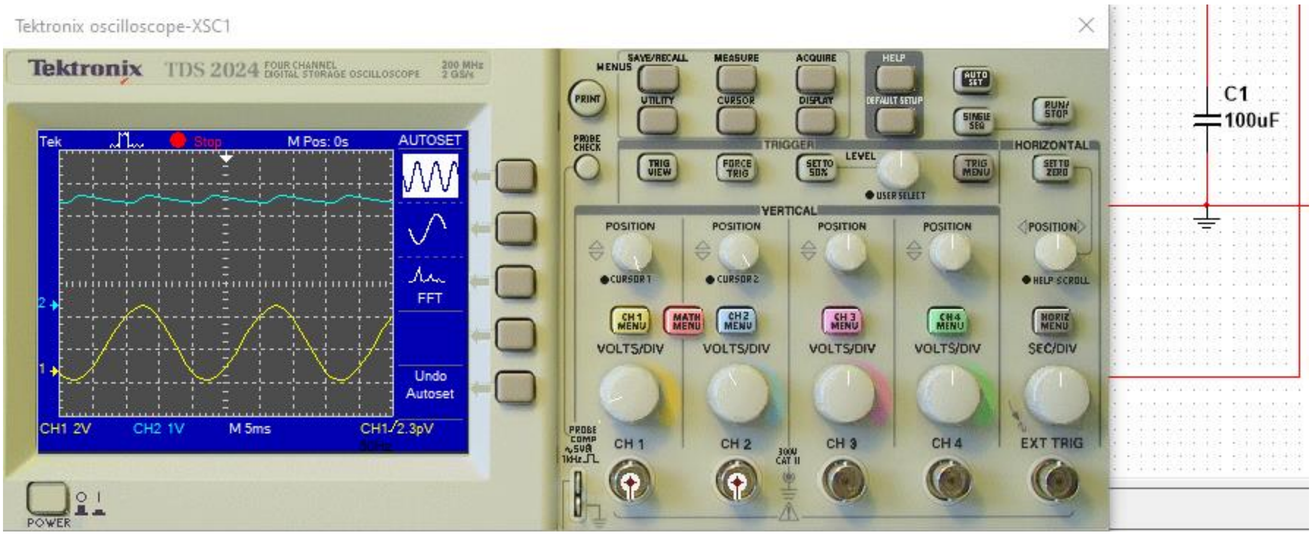
80uF



90uF



100uF



Comments:
Changing capacitance change the ripple factor at the ractified output.

i. Setting C1 to 100uF, change the 'audio' transformer from a 10 to 1 ratio device to a 100 to 1 ratio device and print-screen the input and output waveforms. Also comment on the change this alteration makes to the output voltage (across R1). Explain why this change happens.

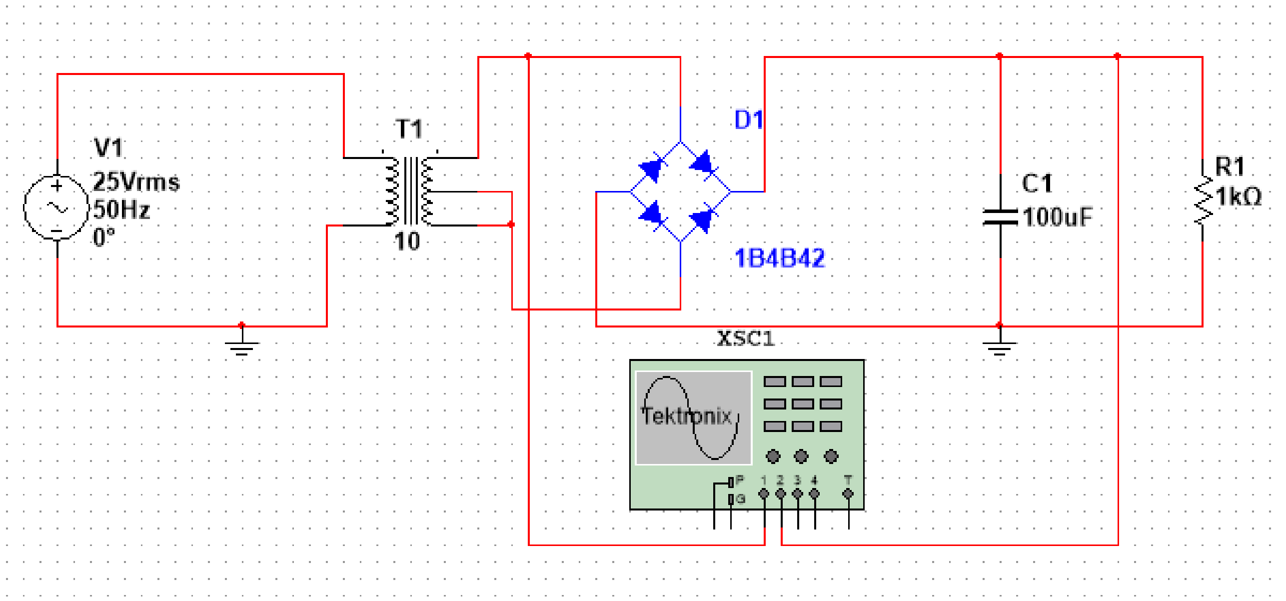


Figure 7: Set Capacitance to 100uF

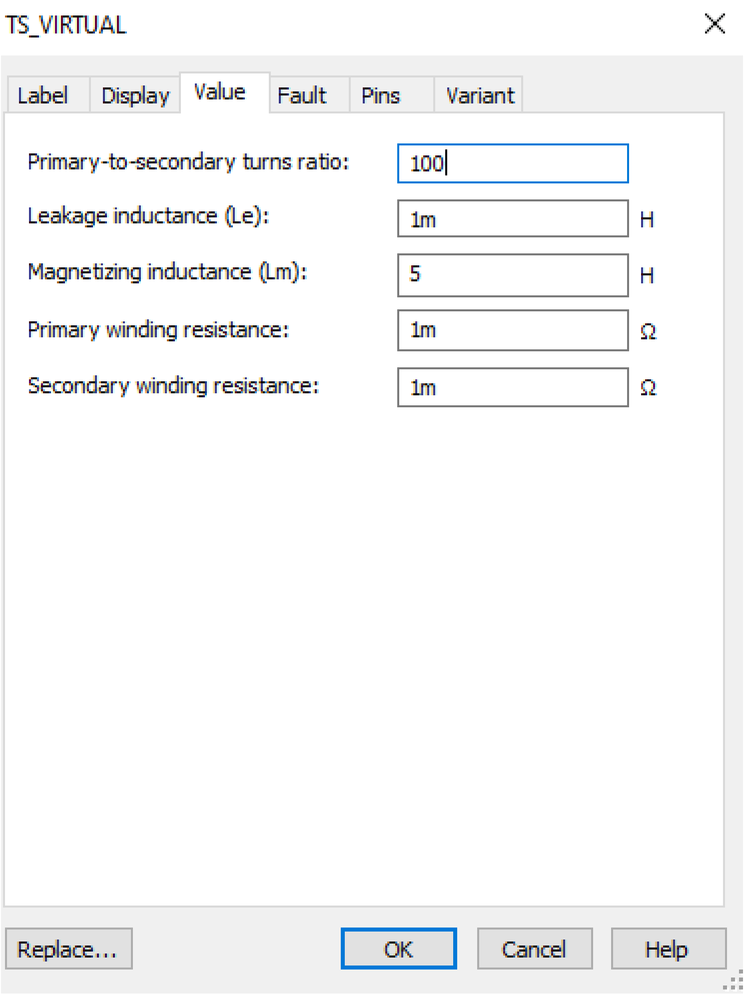
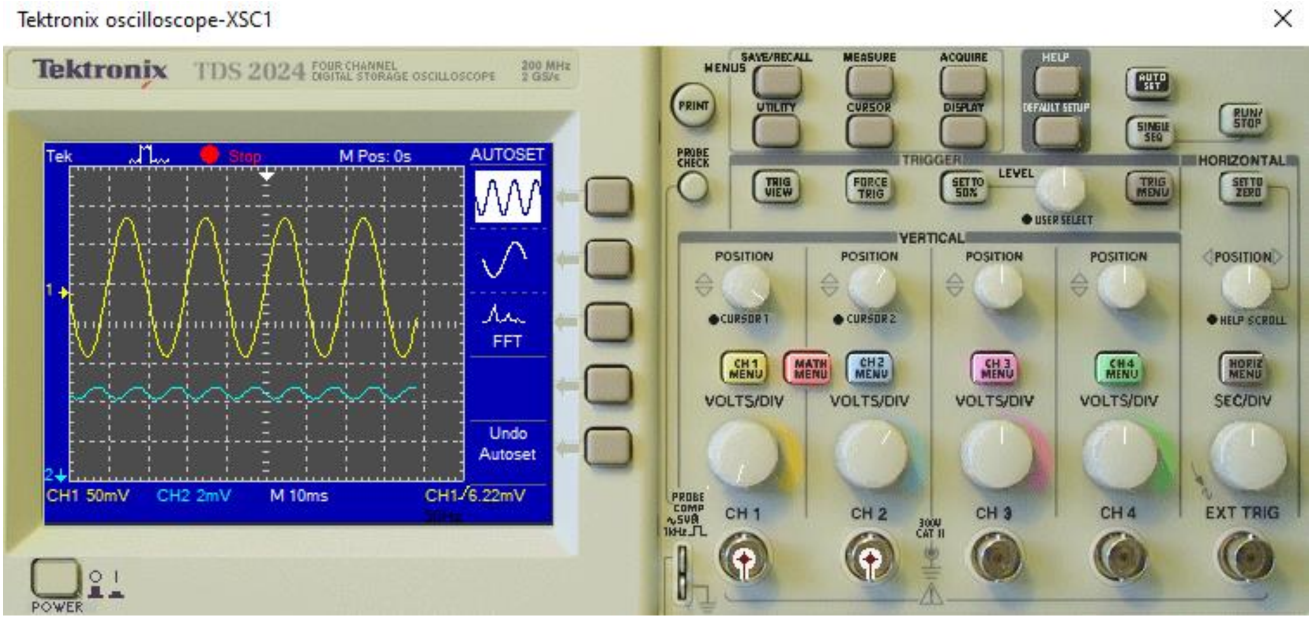
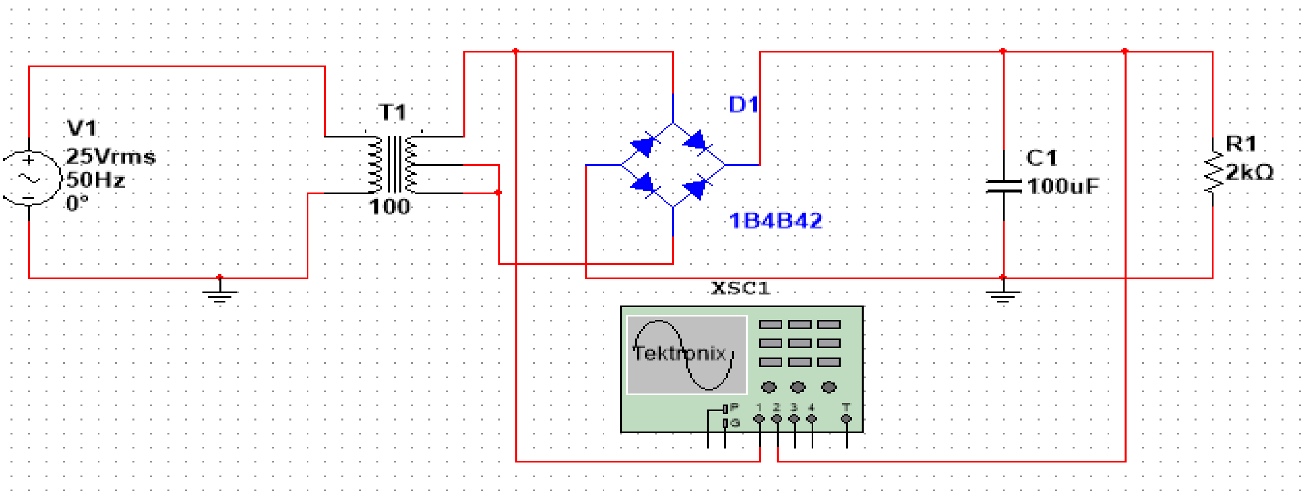
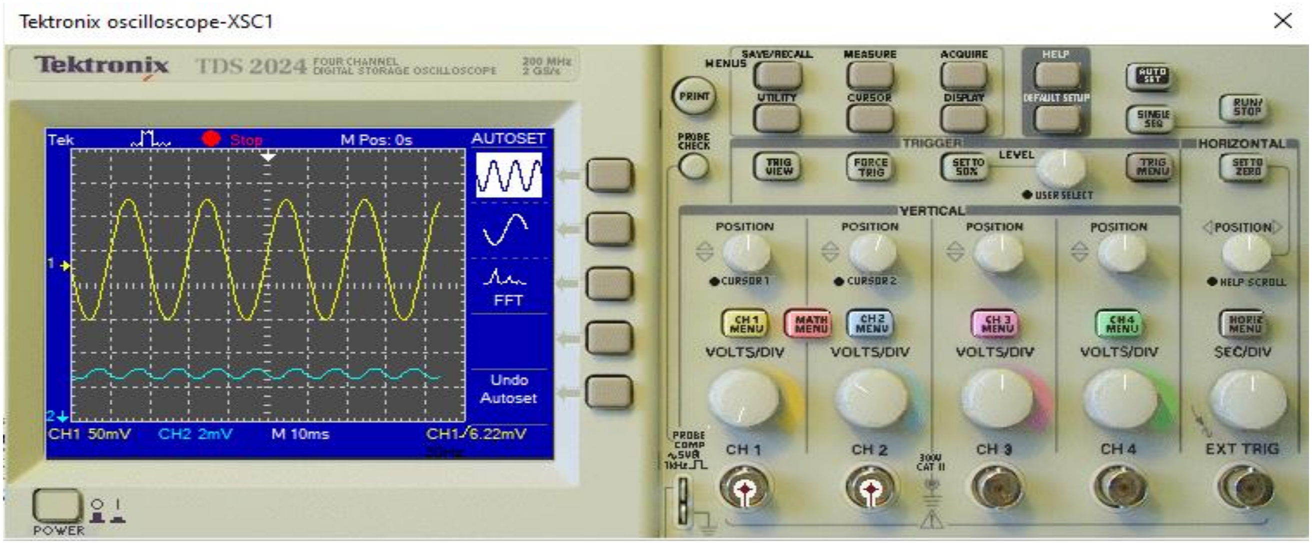


Figure 8: Changes Turns Ratio 100:1


Tektronix oscilloscope-XSC1
Tektronix
TDS 2024
FOUR CHANNEL DIGITAL STORAGE OSCILLOSCOPE
Tek
Stop
M Pos: 0s
AUTOSET
FFT
Undo Autoset
CH1 50mV
CH2 2mV
M 10ms
CH1 ∕ 6.22mV
POWER
CH 1
CH 2
CH 3
CH 4
EXT TRIG
VOLTS/DIV
SEC/DIV
POSITION
TRIGGER
VERTICAL
HORIZONTAL
LEVEL


V1
25Vrms
50Hz
0°
T1
100
D1
1B4B42
C1
100uF
R1
2kΩ
XSC1
Tektronix


Tektronix oscilloscope-XSC1
Tektronix
TDS 2024
FOUR CHANNEL DIGITAL STORAGE OSCILLOSCOPE
Tek
Stop
M Pos: 0s
AUTOSET
FFT
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CH1 ∕ 6.22mV
POWER
CH 1
CH 2
CH 3
CH 4
EXT TRIG
VOLTS/DIV
SEC/DIV
POSITION
TRIGGER
VERTICAL
HORIZONTAL
LEVEL

Comments:
Voltages changes at the output.

Checklist of evidence required: Either T8a Photo/video evidence of experiment and a 200-word commentary on your experiment and findings. **Or T8b** Snip/print-screen images of ECAD build and test with oscilloscope Include clear mages of the waveforms on the oscilloscope/graph screen and a 200-word commentary on your experiment and findings. Save a copy of the simulator and attach copy/link.