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REG.NO.: 21BAI1660

BRANCH: BTECH - CSE AND SPEC IN AI/ML – VITCHENNAI

BECE101P_SLOT-L5+L6_EXPERIMENT – 04

FACULTY: PROF. SASITHRADEVI MA'AM

FULL WAVE RECTIFIER

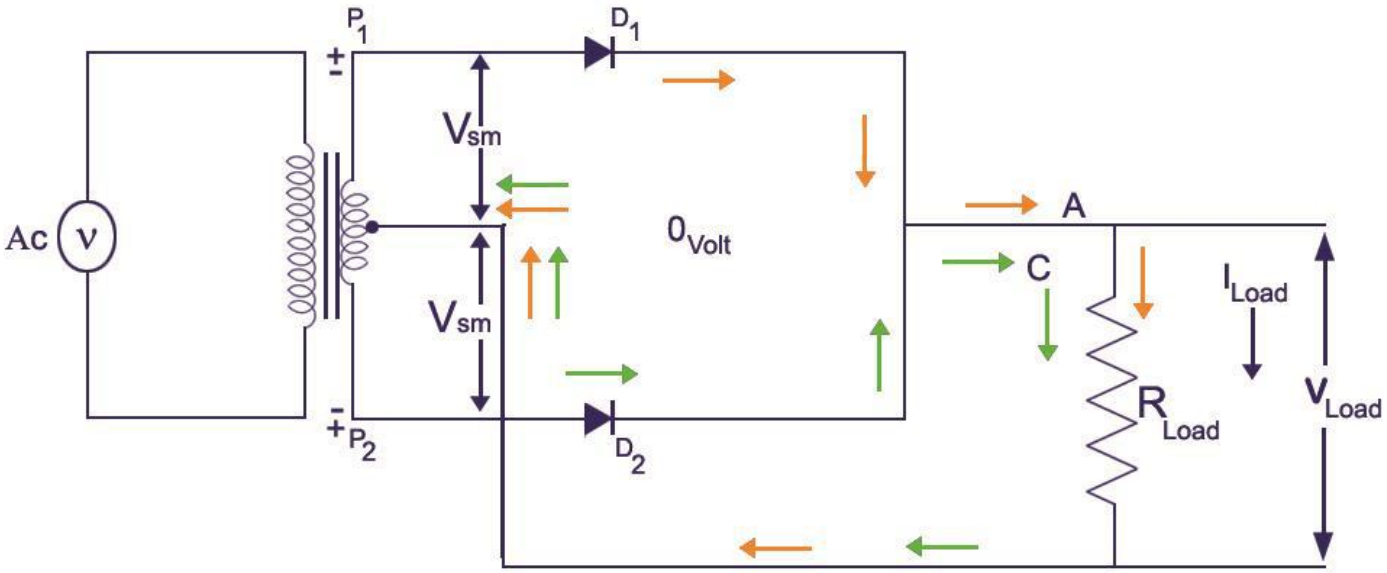
AIM: To understand and to simulate a Full-Wave Rectifier using LT-Spice and calculate the Peak Inverse Voltage.

SOFTWARE REQUIRED: LT-Spice

Apparatus used in LT-Spice: Diode, Inductor, Voltage source, Resistor.

THEORY:

A full wave rectifier is defined as a type of rectifier that converts both half-cycles of an alternating wave (AC signal) into a pulsating DC signal. Full wave rectification is the process of converting an AC signal to a DC signal, requiring multiple diodes to construct. In the case of centre-tap full wave rectifier, only two diodes are used, and are connected to the opposite ends of a centre-tapped secondary transformer as shown in the figure below. The centre-tap is usually considered as the ground point or the zero-voltage reference point.



CENTRE - TAP FULL- WAVE RECTIFIER CIRCUIT

PEAK INVERSE VOLTAGE OR PEAK REVERSE VOLTAGE (PIV OR PRV):

It refers to the maximum voltage a diode or any other device can withstand in the reverse-biased direction before breakdown.

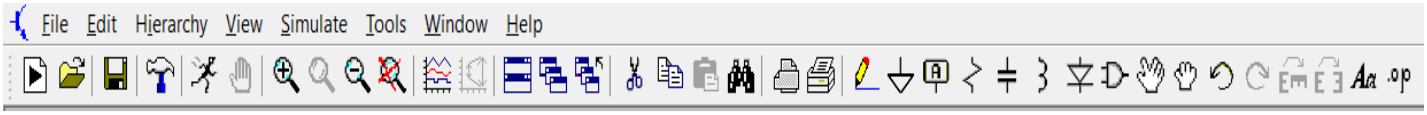
In Positive half cycle, $V_M = V_{OUT}$.

For, diode2: $V_M + V_{OUT} = PIV$

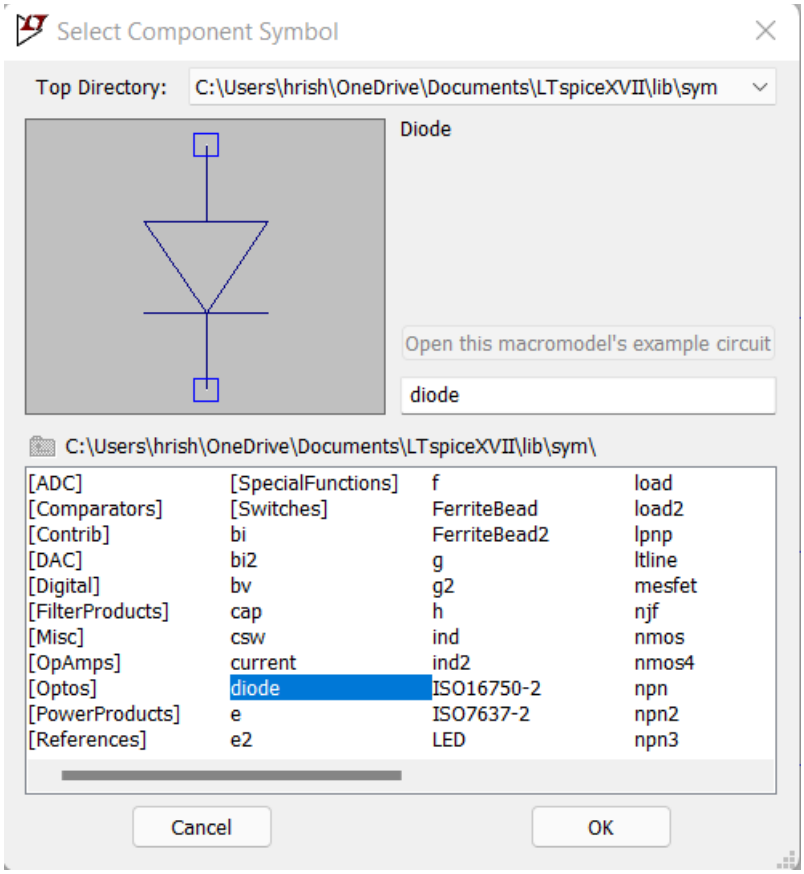
So, **PIV = $2V_M$ (or $2V_{OUT}$)**

STEPS:

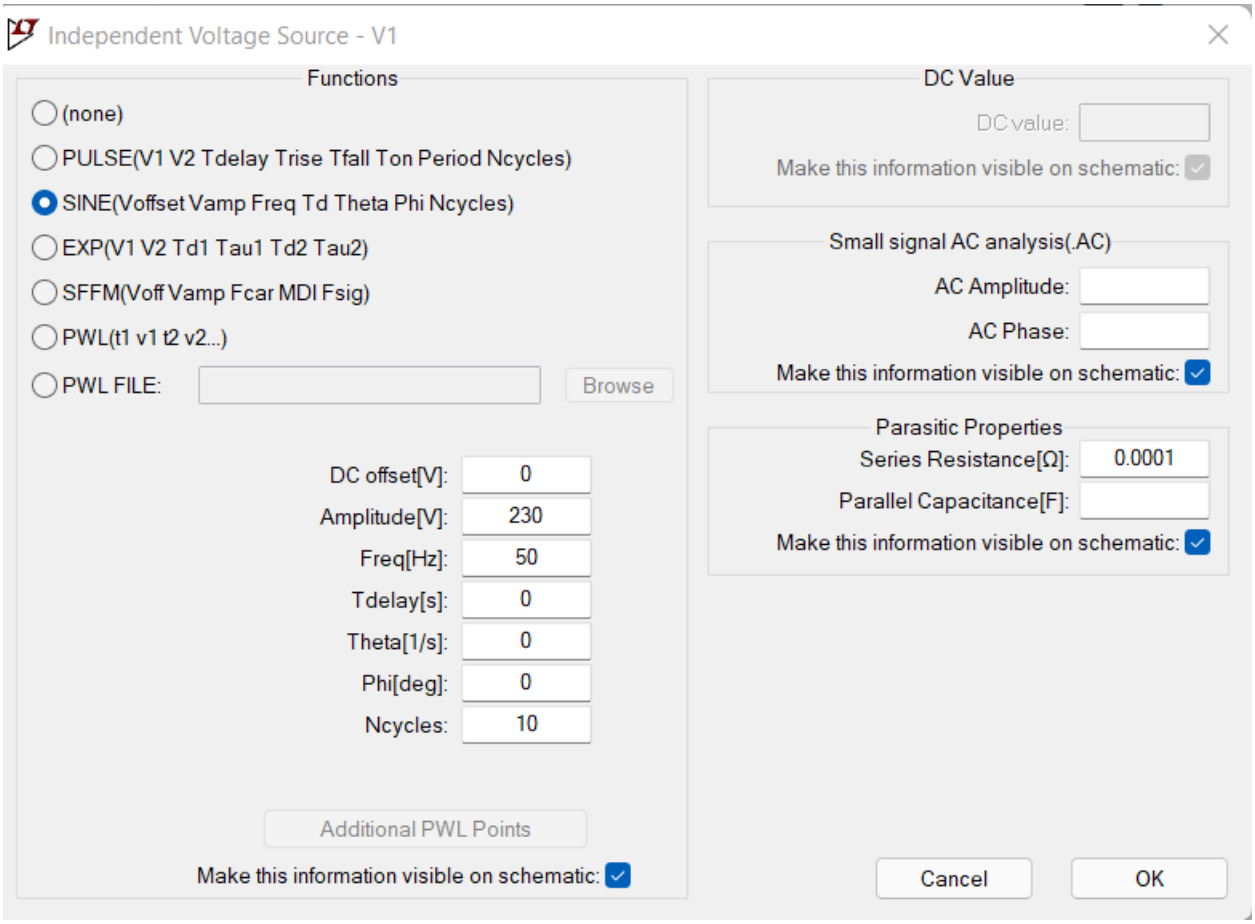
- Open Lt-spice, under file click on new schematic**.**
- Using the text icon on the tool bar, write experiment name, name and reg.no.
- Using toolbar, components, Draw the circuit as shown later in the diagram.



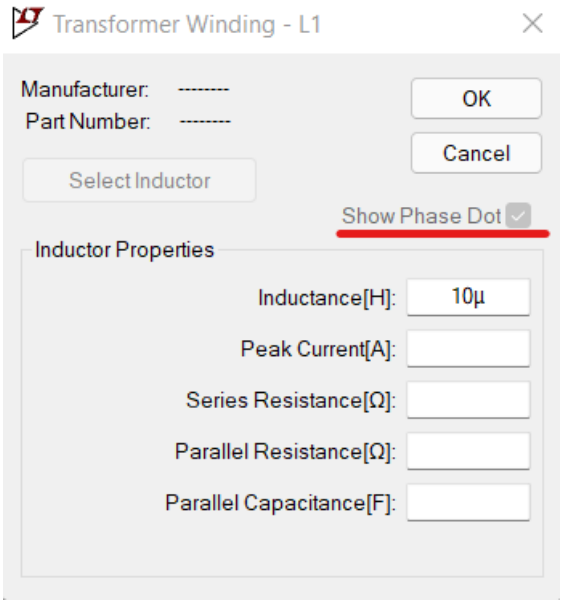
- Use inductors, resistors, voltage source, grounding and the diode from the component library draw the circuit.



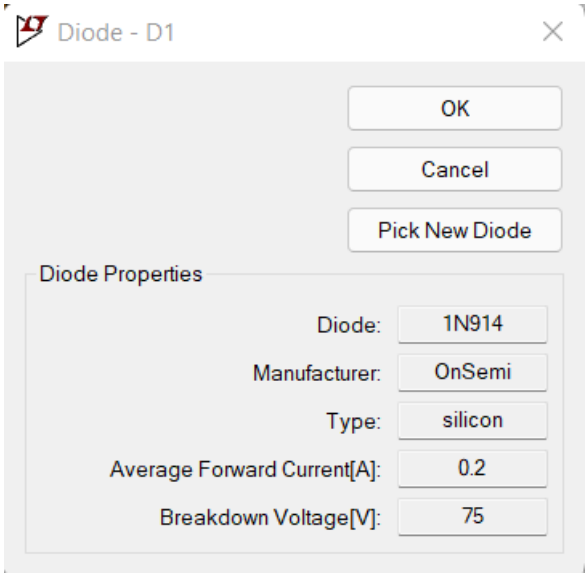
- Right click on the voltage source, click advanced and then click SINE and give settings as shown below. Also give R series as 0.0001 ohm.

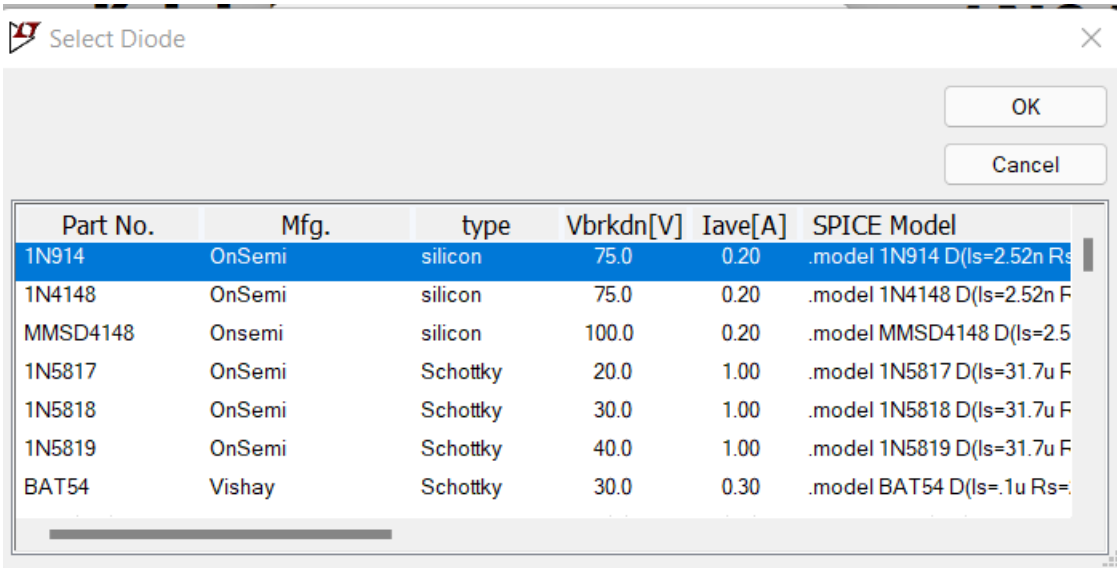


- Then give all values as shown in the circuit by right clicking on the components.
- For inductor click on show phase dot after right clicking.

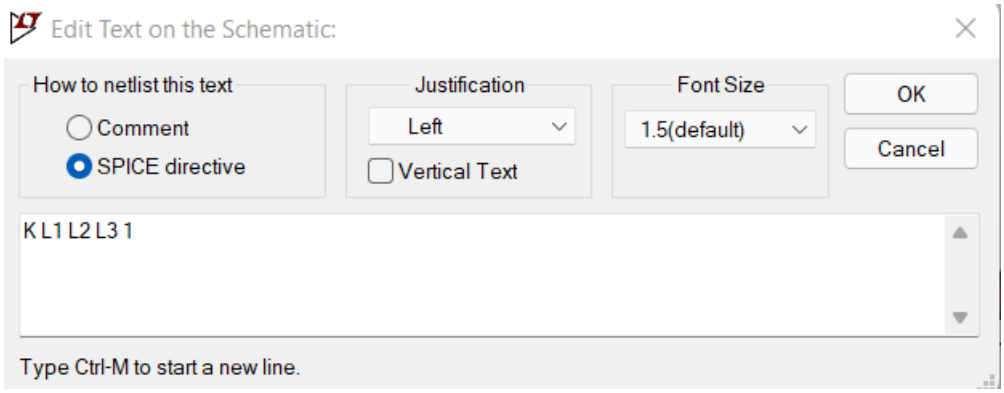


- Right click on both diodes, click on pick new diode and choose 1N914 diode for both.

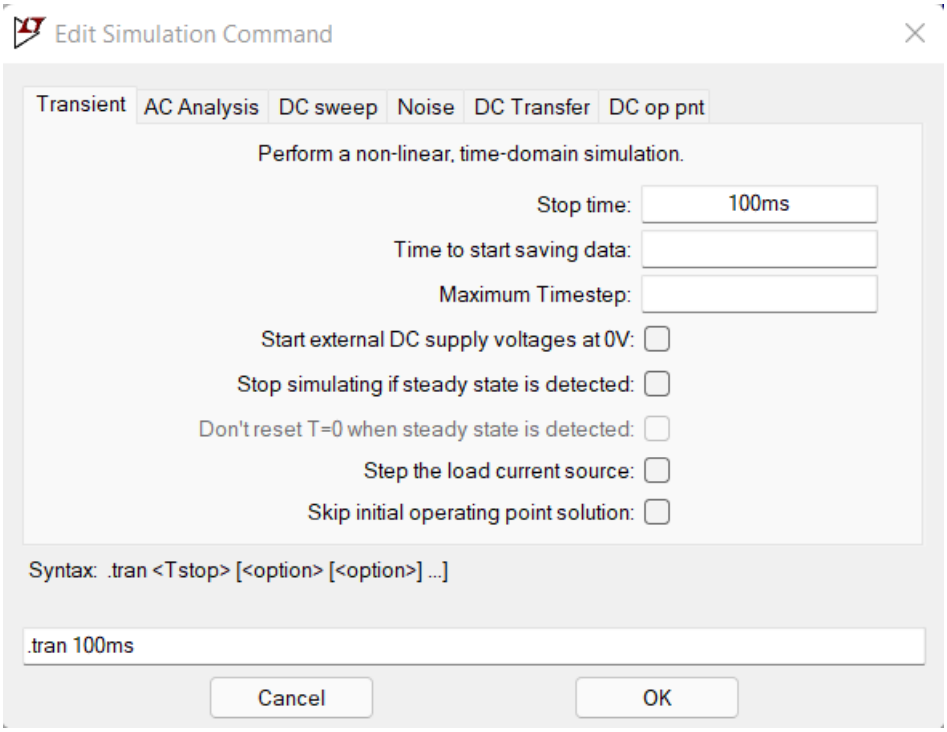




- Place another grounding on the right-side resistance wire.
- Click on the .op and under spice directive give K L1 L2 L3 1. And click ok.

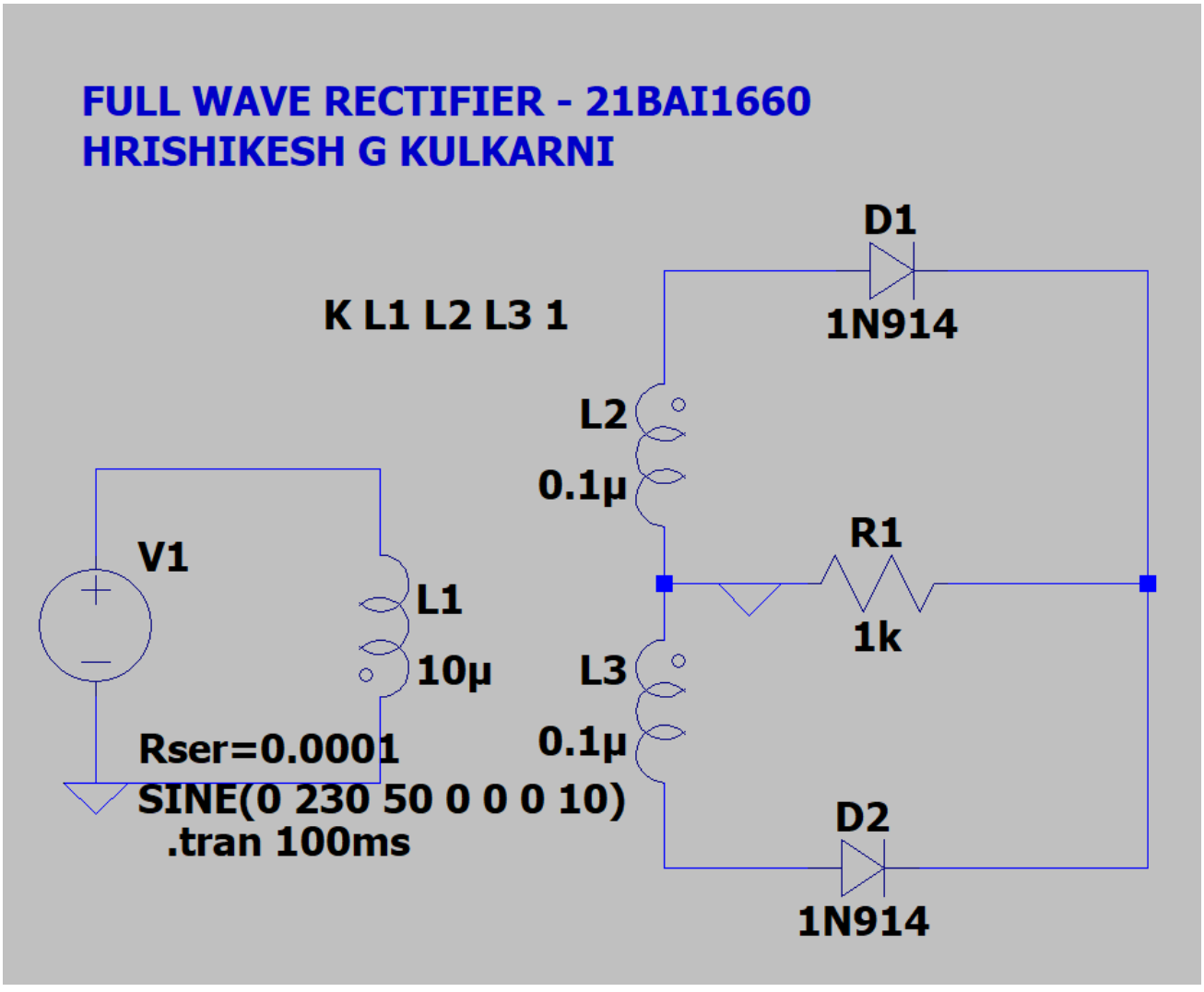


- Click on simulate and under edit simulation command, then enter 100ms in stop time.

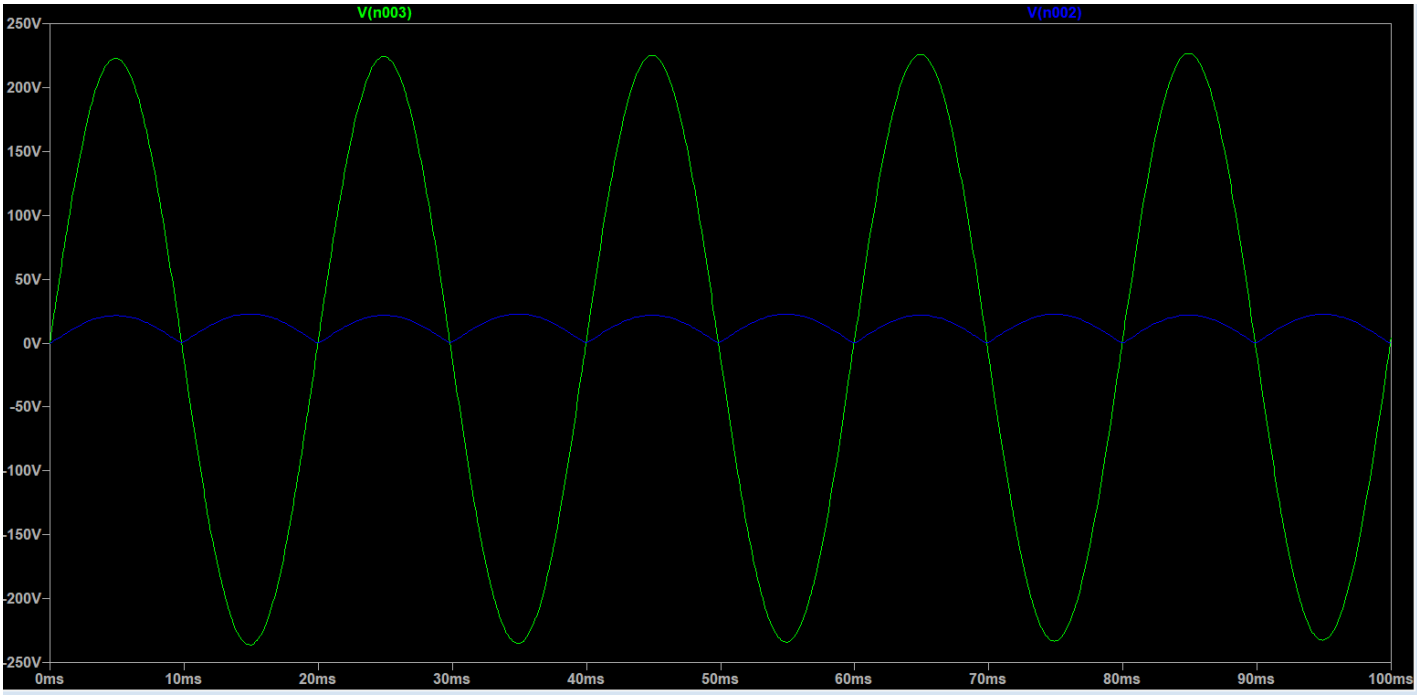


- Click on Run button. Click on the positive terminal of voltage source to get input voltage. Click on one node of the resistor to get the output voltage graph on the same Plot Pane.

CIRCUIT DIAGRAM:



OUTPUT:



Inference:
Peak Inverse Voltage = 2Vm = 2 x 21.62 = 43.24 V

Efficiency(n): Output/Input = DC power/AC power = $(I_{DC}/I_{RMS})^2 = [8/(pi)^2]$
DC power is $(I_{DC})^2 * R$
AC power is $(I_{RMS})^2 * R$
Efficiency of full-wave rectifier = 81.14 %

A full-wave rectifier converts AC voltage to DC voltage in both positive and negative half-cycles of the given sinusoid.

-----THE END-----