INDRAPRASTHA INSTITUTE *of*
INFORMATION TECHNOLOGY
DELHI

Department
of
Electronics & Communication Engineering

Circuit Theory and Devices

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Lab_2: Rectifiers
Week_2

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Objective:

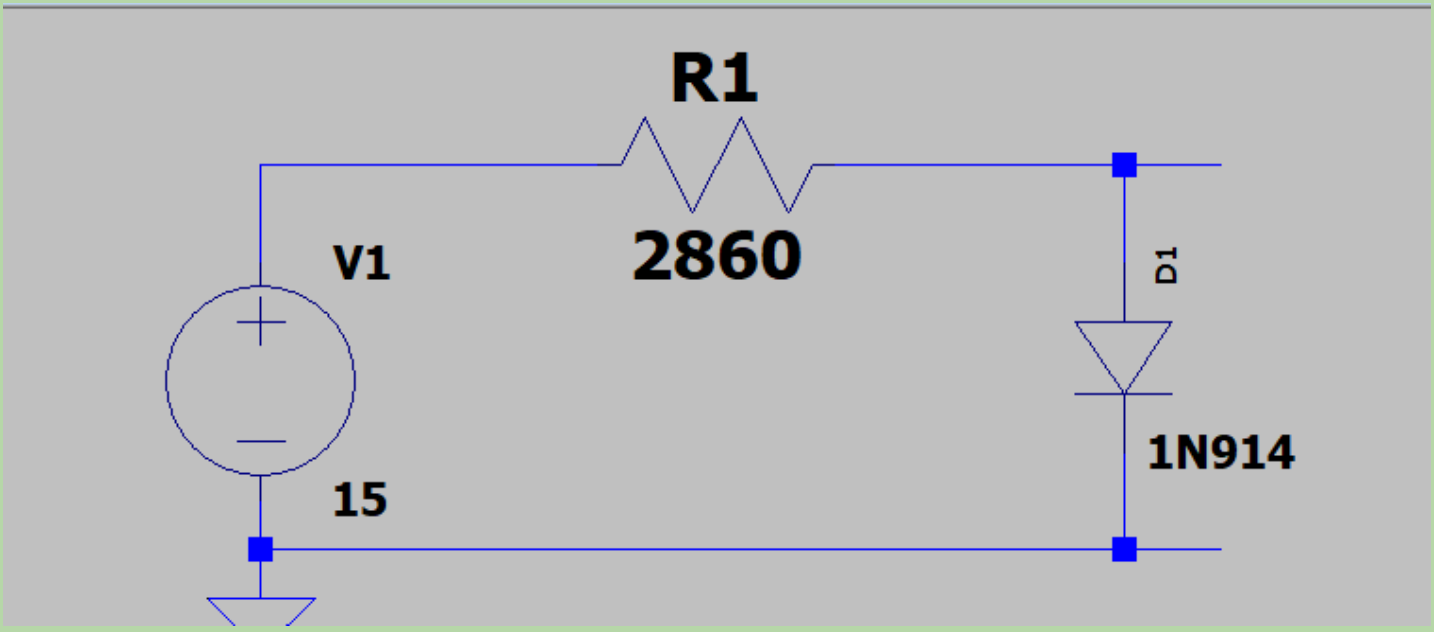
1. Design of three different types of rectifiers in LTSpice.
2. Explore ways to reduce the ripple in the output voltage.

Components Used:

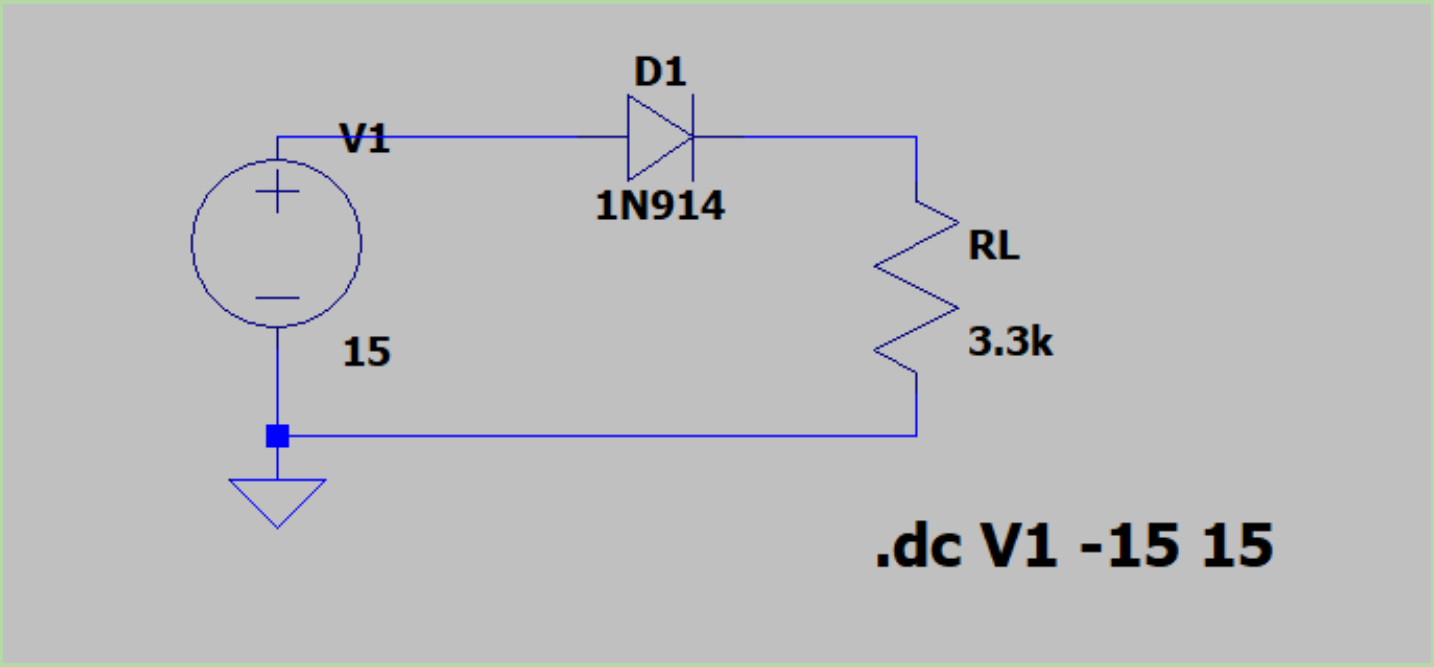
- LTSpice as Simulation Software
- Transformer
- Diode
- Voltage Source
- Resistors

Diagram:

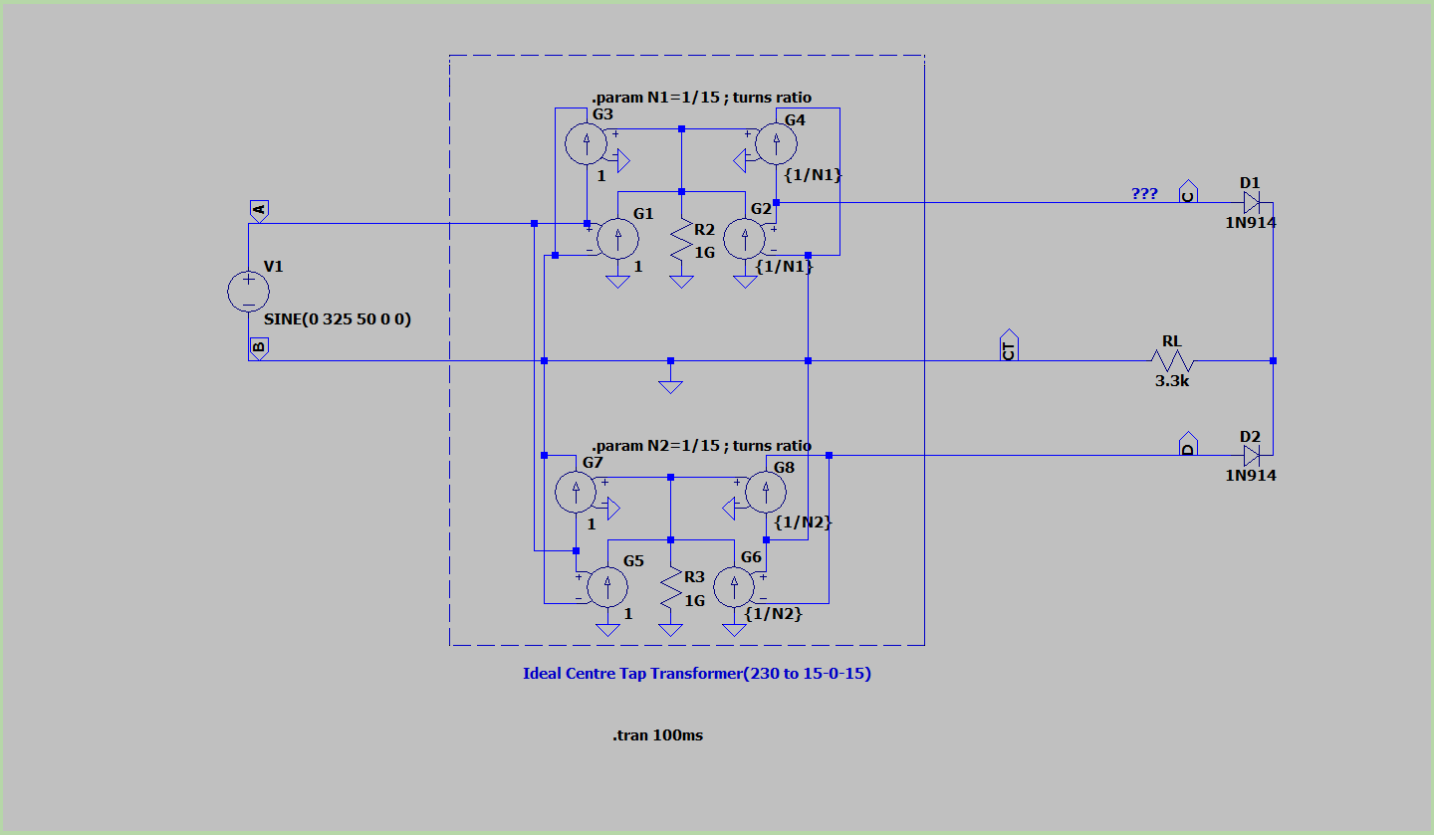
- **Limiting Circuit / Diode Clipping Circuit:**



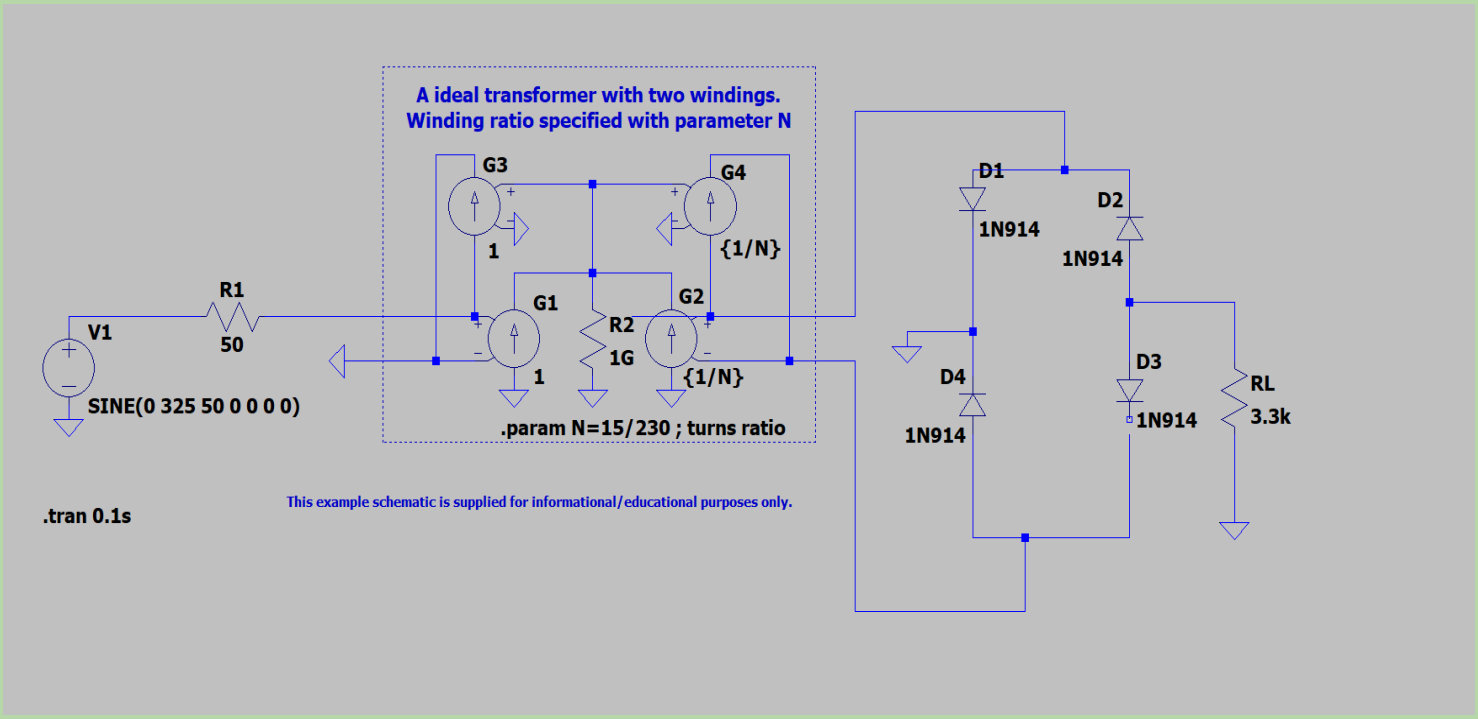
- **Half-Wave rectifier**



- **Center Tapped Full wave rectifier**



- **Full Wave Bridge Rectifier**



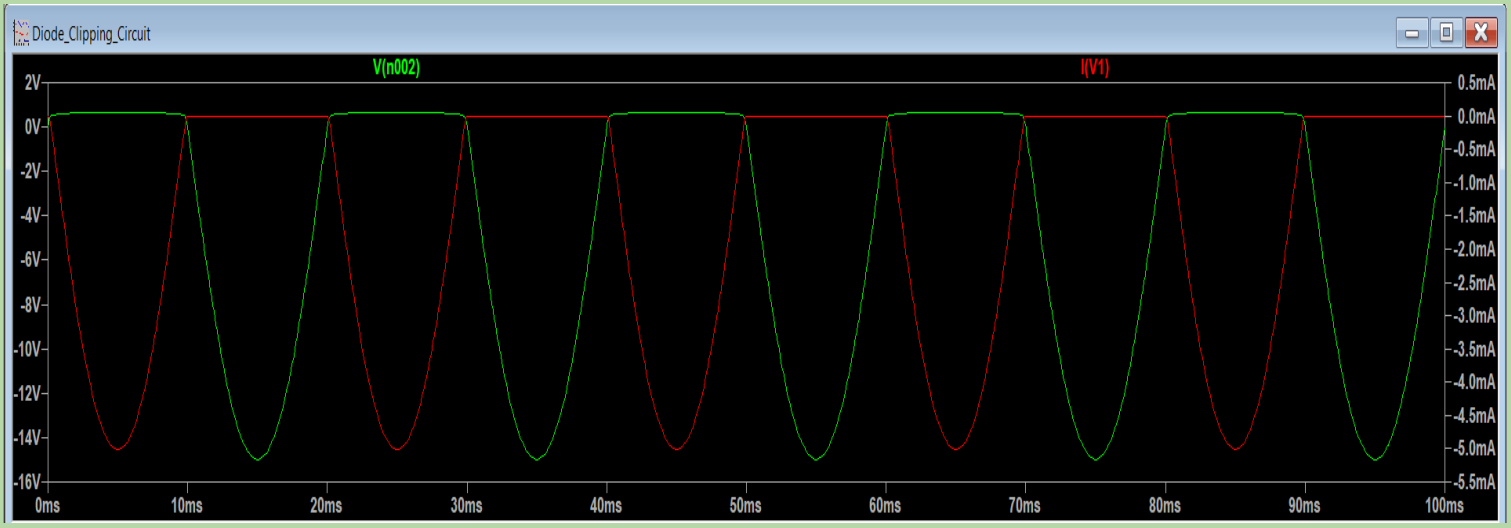
Plots:

- **Limiting Circuit / Diode Clipping Circuit:**

❖ I-V characteristic of the diode (voltage and current across the diode)

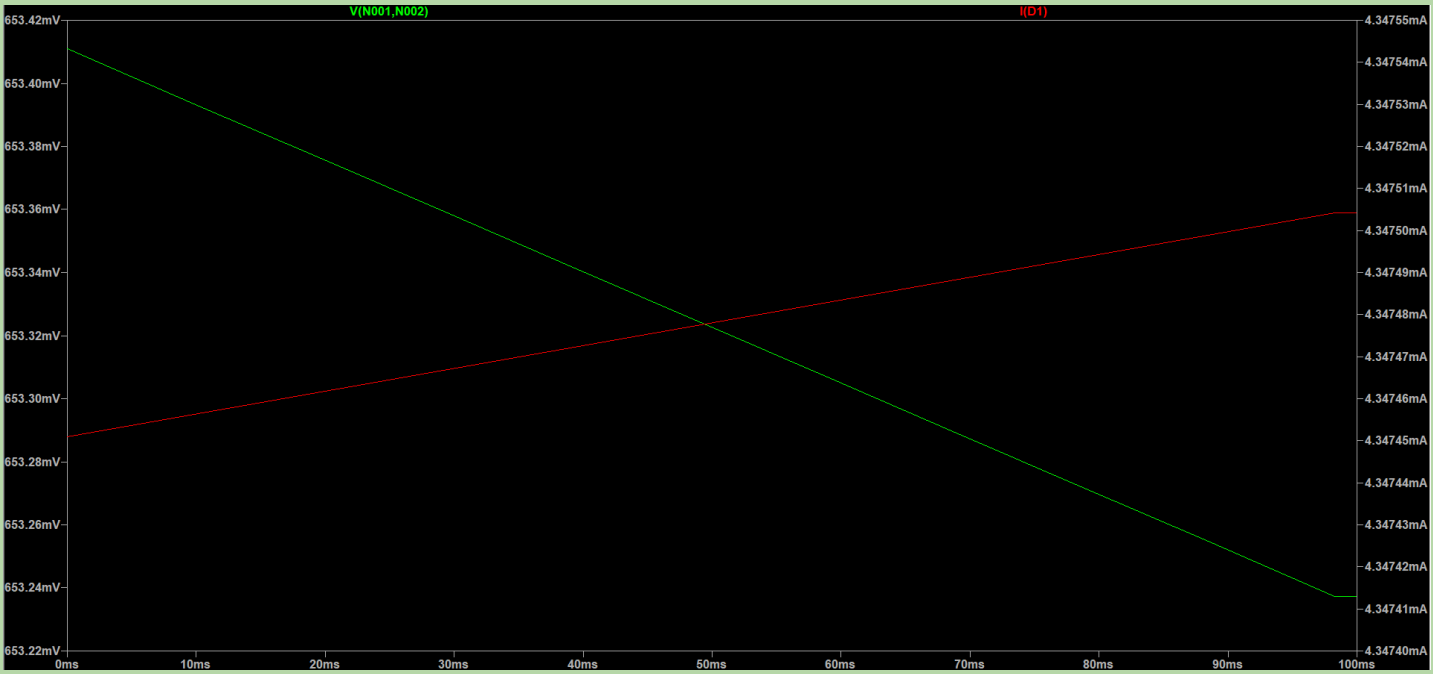
- plot the transfer function (VOUT divided by VIN) of the circuit. Note that the diode voltage is the output voltage

- A transient simulation for the circuit keeping VIN as 15V, 50Hz sinusoidal wave



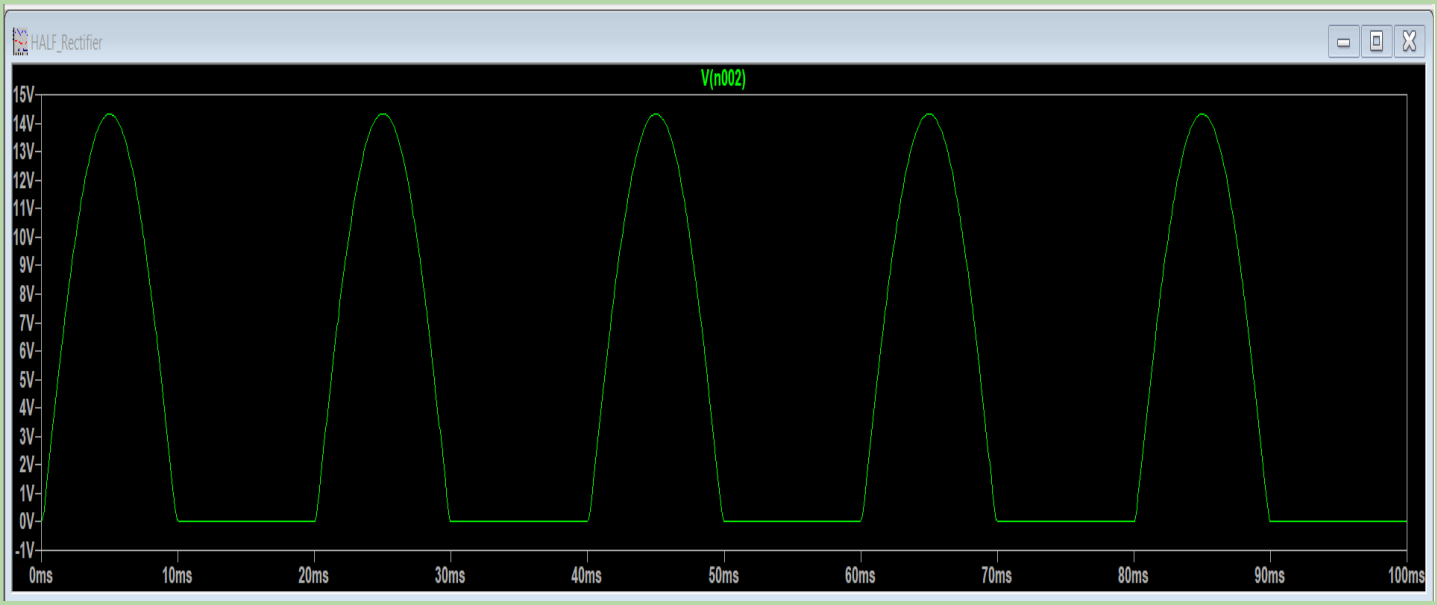
- **Half-Wave Rectifier**

  - **Diode voltage and diode current**

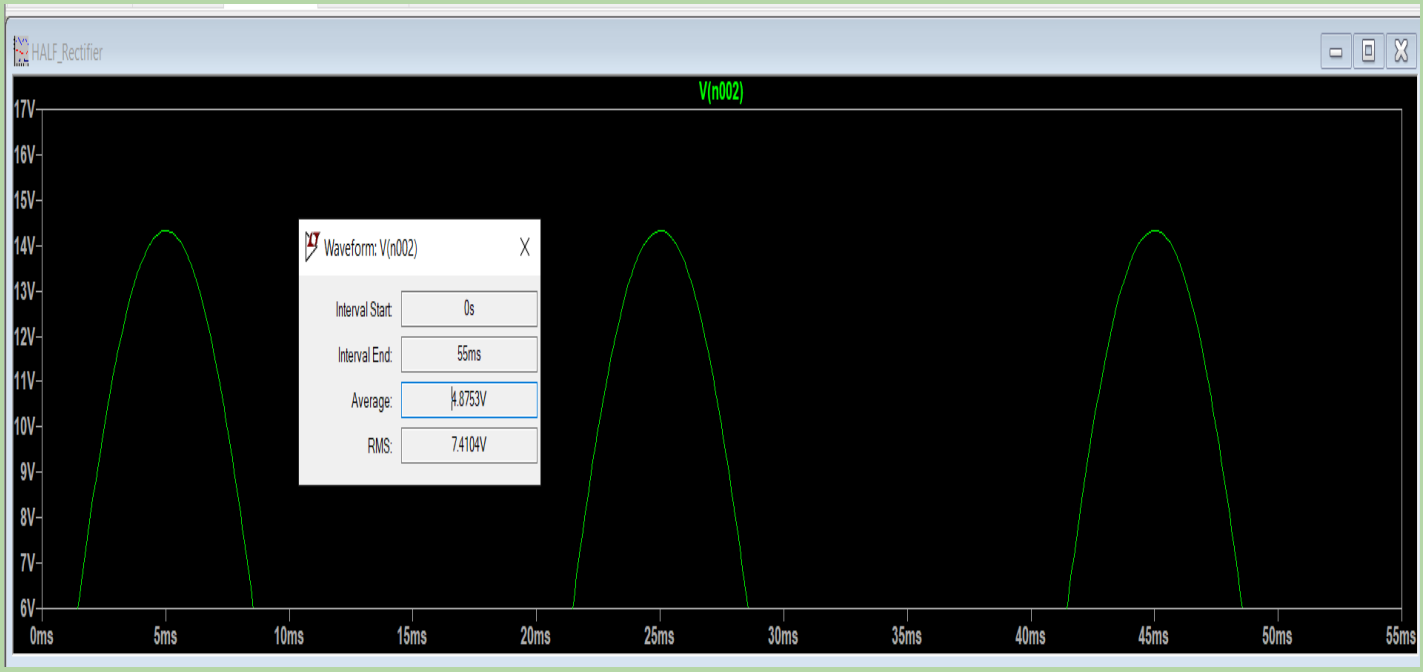


- transfer function (VOUT, divided by VIN) of the circuit. Note that the resistor voltage is the output voltage in this circuit

❖ Replace the DC source with an AC source excitation with an amplitude of 15V and a frequency of 50Hz. Use LTSpice to plot the resistor's voltage across several time cycles using transient simulation.

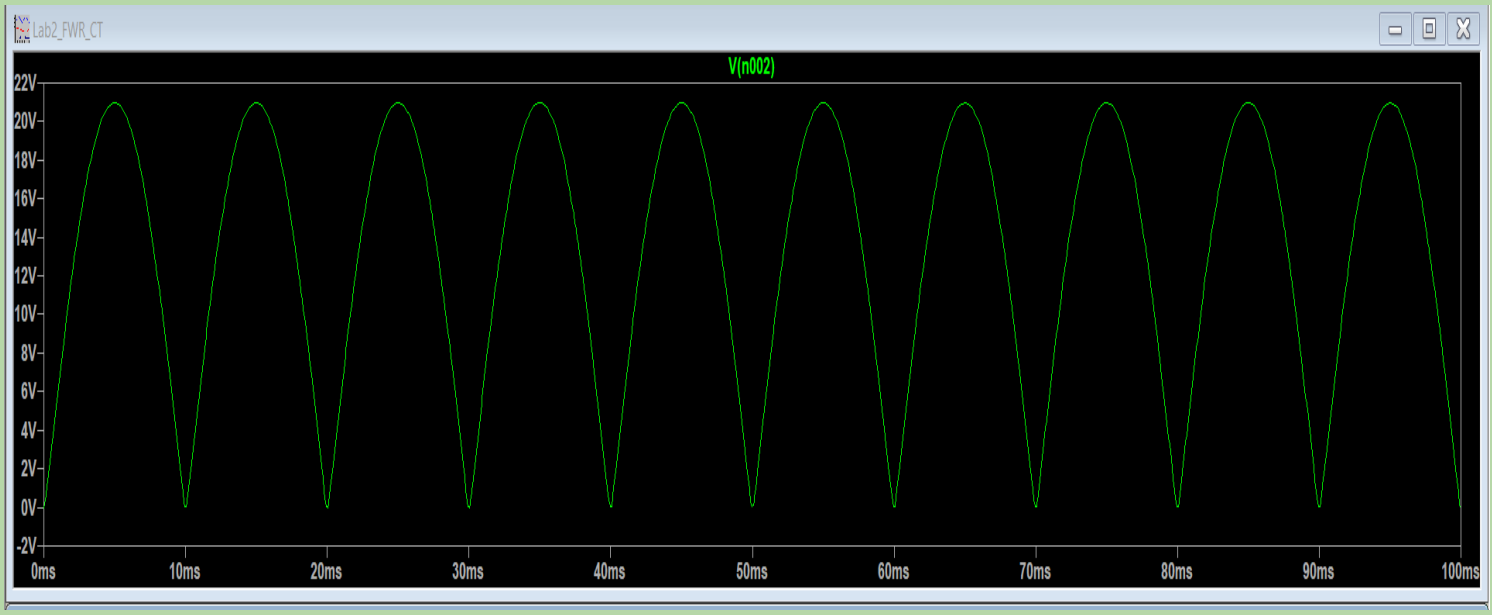


❖ The time-averaged output voltage, VOUT,, across three time cycles

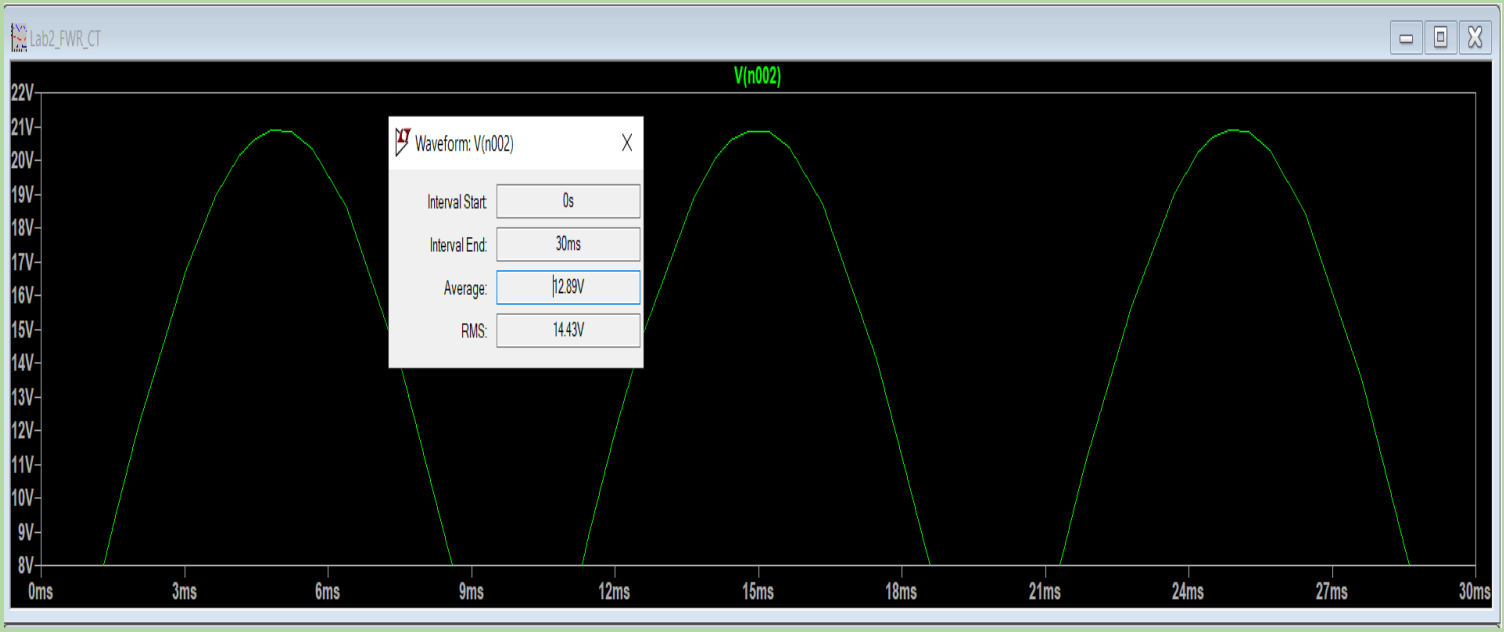


- **Center Tapped Full wave rectifier**

❖ Use an AC source excitation with an amplitude of 230Vrms and a frequency of 50Hz as the input to the primary of an ideal step down transformer (15:1). Use LTSpice to plot the resistor's voltage across several time cycles using transient simulation

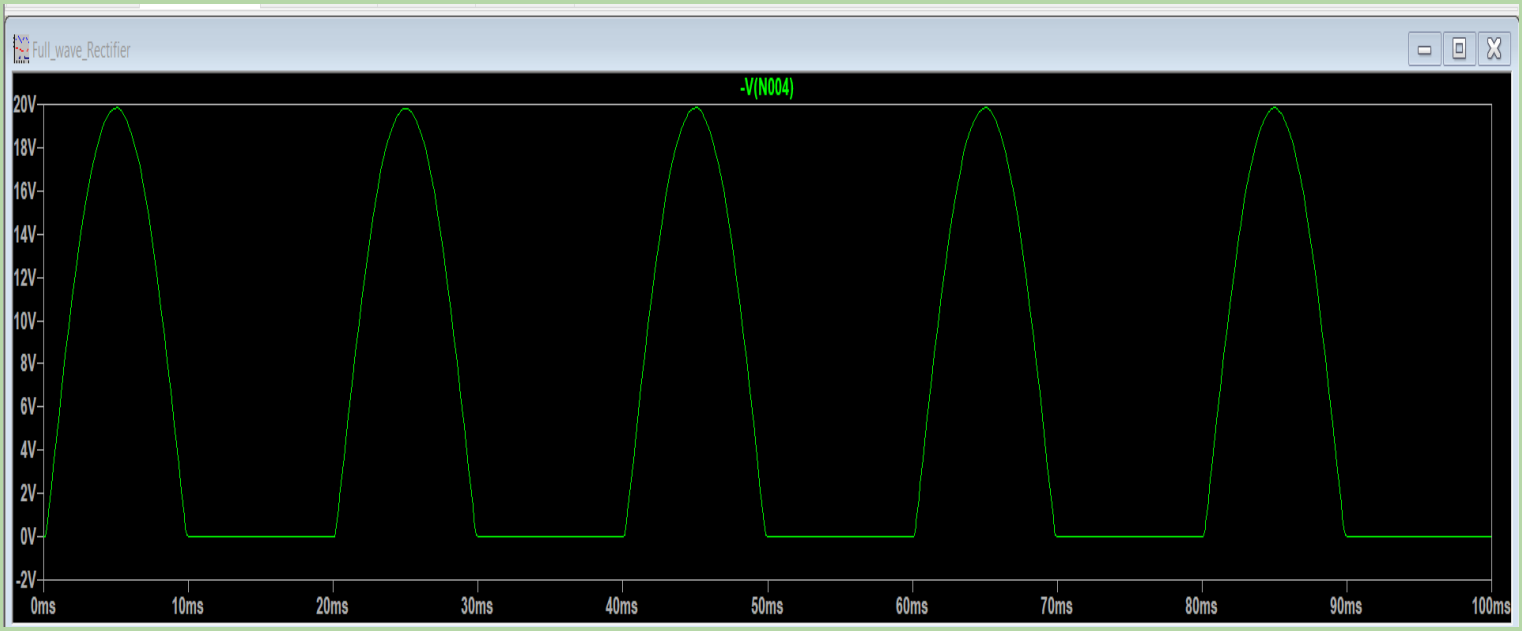


❖ the time-averaged output voltage across three time cycles

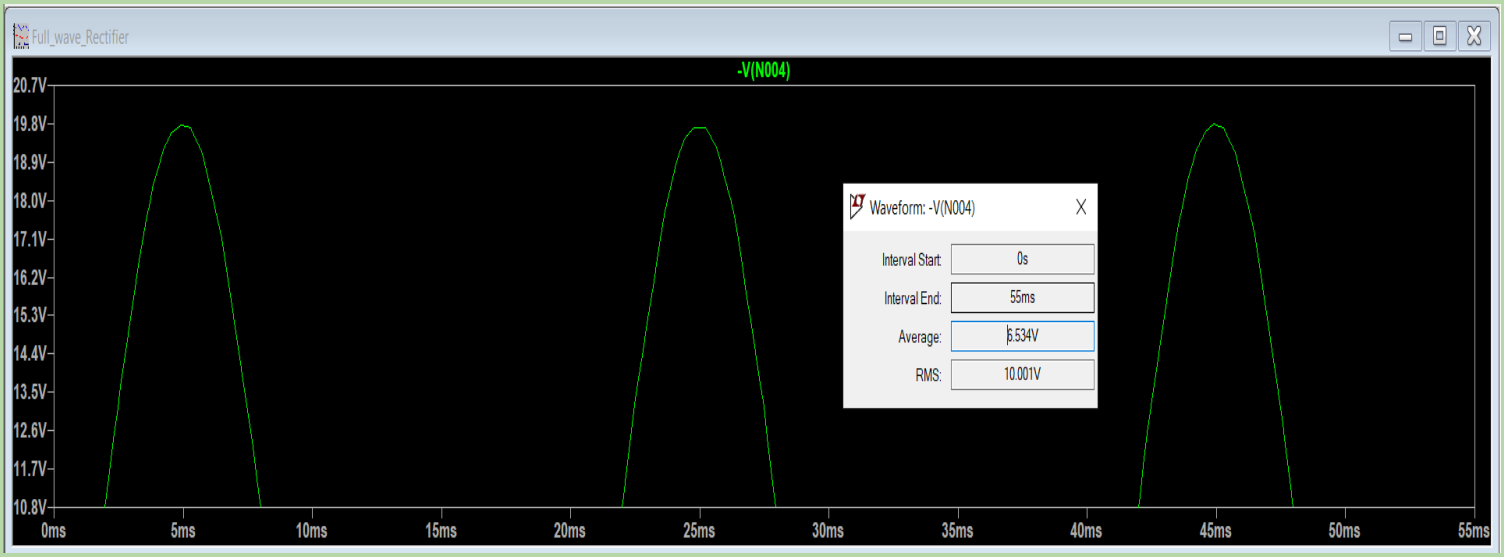


- **Full Wave Bridge Rectifier**

❖ Use an AC source excitation with an amplitude of 230Vrms and a frequency of 50Hz in the primary of an ideal step down transformer (15:1). Use LTSpice to plot the resistor's voltage across several time cycles using transient simulation



❖ The time-averaged output voltage across three time cycles



Observations:

- Half-Wave Rectifier
  Vavg=4.8753 V
  Vrms=7.4104 V

- Center Tapped Full wave rectifier
  Vrms=14.43/1.41=10.2035 V
  Vavg=12.84/1.41=9.079 V

- Full-wave Bridge Rectifier
  Vrms=10.001/1.41=4.6202 V
  Vavg=6.534/1.41=4.6202 V

Conclusions:

From the above results we can observe that Center Tapped Full wave Rectifier is giving maximum avg Voltage and max root mean square Voltage Hence we will prefer it for our circuit.