University of Anbar
College of Engineering
Dept. of Electrical Engineering

Lab. Name: Electronic I
Experiment no.: 3
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Experiment #3- Part#3

Diode Applications 1

Rectifier Circuit

Procedure

1. Connect the half-wave rectifier circuit shown in Fig.8. Measure the DC output voltage, peak value of the secondary winding voltage, and the peak value of the output voltage as tabulated in Table 1. Sketch the output waveform.

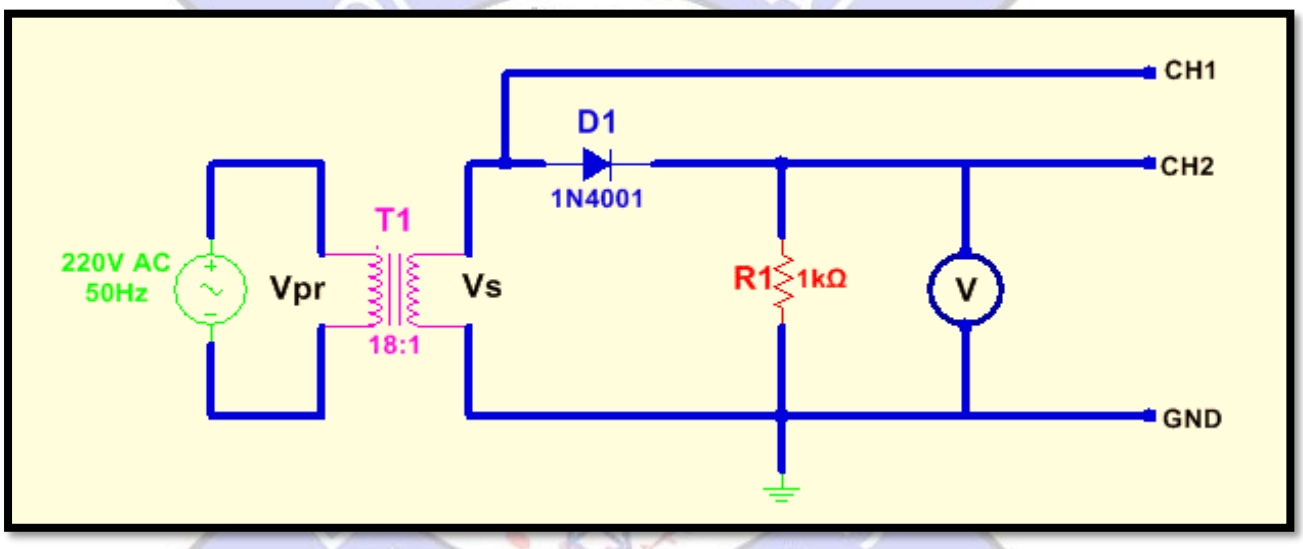

Figure 8: The Practical Half-Wave Rectifier Circuit

Table 1: Recorded Data for the Half-wave Rectifier Circuit

Quantity	Measured Value	Calculated Value
V_{sp}		
V_{op}		
V_{dc}		

2. Connect a capacitor filter at the output of the half-wave rectifier as shown in Fig.9, and measure the DC output voltage and peak-to-peak ripple voltage in the output.

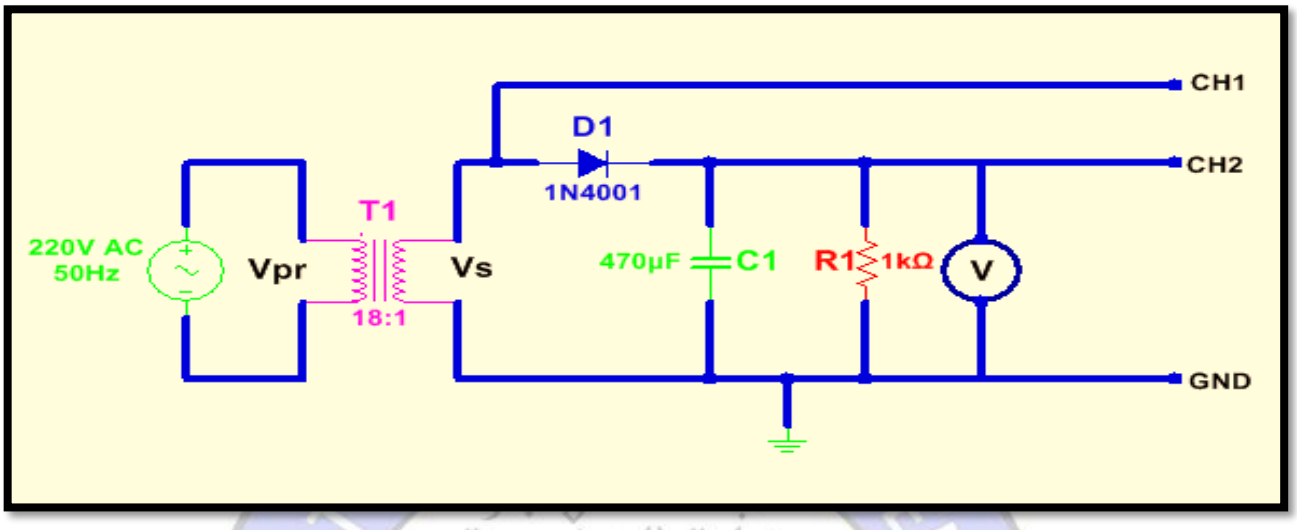

Figure 9: Practical Capacitor Filter Connected to the Half-Wave Rectifier

Table 2: Recorded Data for the Capacitor Filter Connected to the Half-Wave Rectifier

Quantity	Measured Value	Calculated Value
V_{dc}		
$V_{r(pp)}$		

3. Repeat step 2 after replacing the filter capacitor with another one of value 10µF.
4. Connect the full-wave center-tapped transformer rectifier circuit shown in Fig.10.Measure the DC output voltage, peak value of the secondary winding voltage, and the peak value of the output voltage as tabulated in Table 3. Sketch the output waveform in this case.

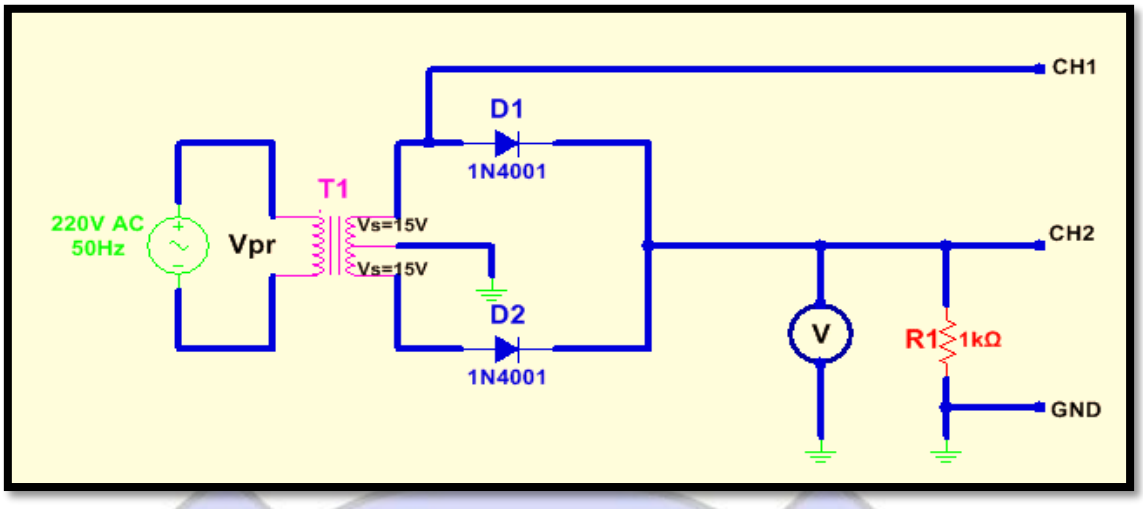

Figure 10: Practical Circuit for the Center-Tapped Full-Wave Rectifier

Table 3: Recorded Data for the Center-Tapped Rectifier Circuit

Quantity	Measured Value	Calculated Value
V_{sp}		
V_{op}		
V_{dc}		

5. Connect a capacitor filter at the output of the full-wave rectifier as shown in Fig.11, and measure the DC output voltage and peak-to-peak ripple voltage at the output.

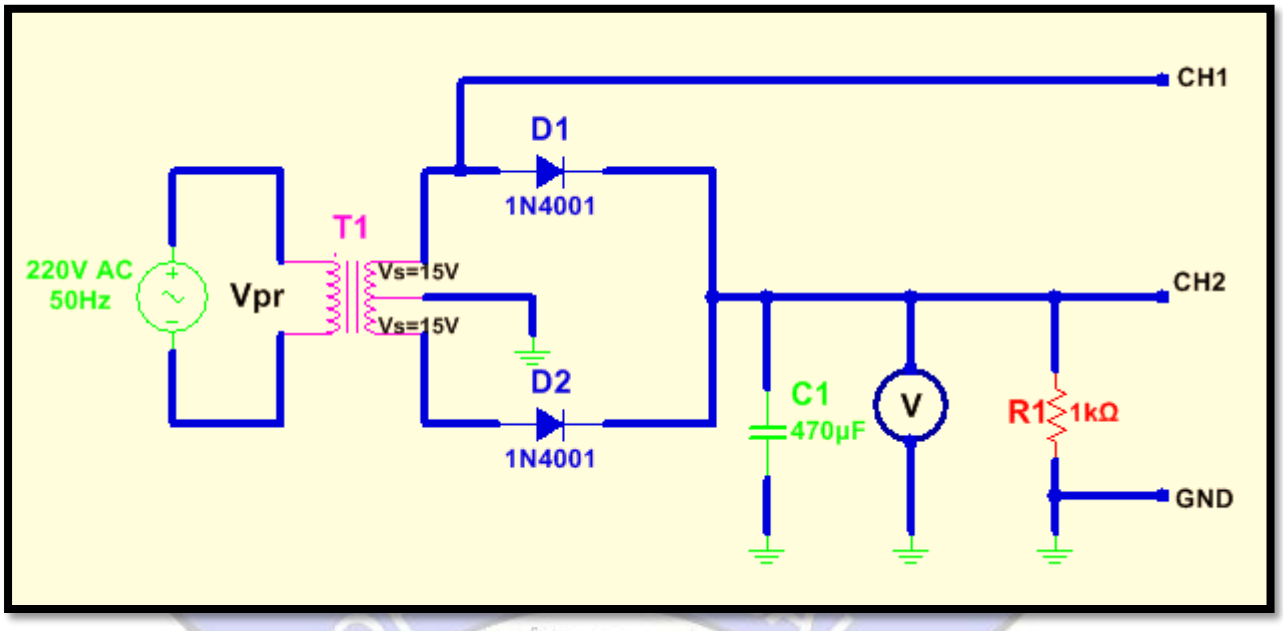

Figure 11: Practical Circuit for the Center-Tapped Full-Wave Rectifier with the Capacitor Filter

Quantity	Measured Value	Calculated Value
V_{dc}		
$V_{r(pp)}$		

6. Replace the filter capacitor with another one of value 10µF and repeat step 5.

7. Connect the full-wave bridge rectifier circuit shown in Fig.12. Measure the DC output voltage, and the peak value of the output voltage as tabulated in Table 5. Sketch the output waveform in this case. It should be noted that the secondary winding waveform in this case is similar to that of the center-tapped full-wave rectifier.

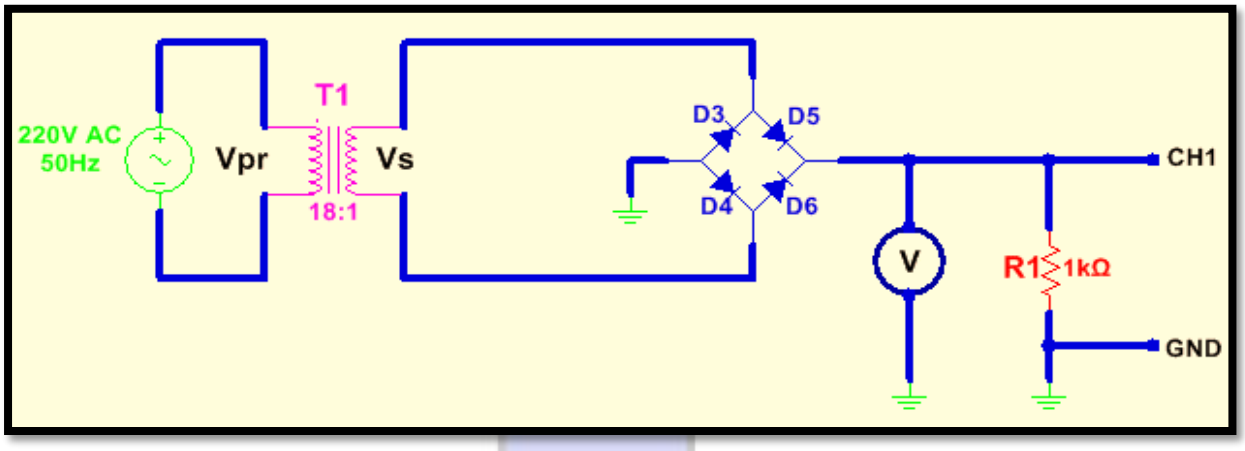

Figure 12: The Practical Full-Wave Bridge Rectifier Circuit

Table 5: Recorded Data for the Full-Wave Bridge Rectifier Circuit

Quantity	Measured Value	Calculated Value
V_{op}		
V_{dc}		

8. Connect a capacitor filter at the output of the full-wave bridge rectifier as shown in Fig.13, and measure the DC output voltage and peak-to-peak ripple voltage at the output.

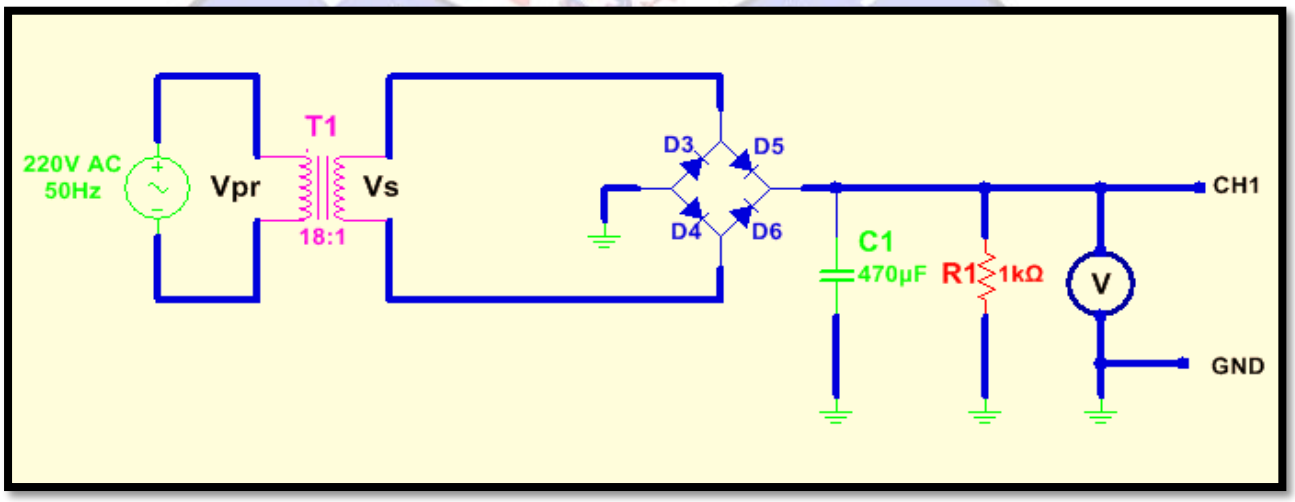

Figure 13: Practical Circuit for the Full-Wave Bridge Rectifier with the Capacitor Filter

Table 6: Recorded Data for the Full-wave Bridge Rectifier and Filter Circuit

Quantity	Measured Value	Calculated Value
V_{dc}		
$V_{r(pp)}$		

9. Replace the filter capacitor with another one of value 10μF and repeat step 8.

Calculations and Discussion

1. Calculate the theoretical output DC voltage of the half-wave rectifier circuit and compare it with measured value. For the capacitive filter, obtain the theoretical values of the DC output voltage and the ripple voltage and compare these values with the measured quantities. Determine also the practical and theoretical values of the ripple factor.
2. Calculate the theoretical output DC voltage of the center-tapped full-wave rectifier circuit and compare it with measured value. For the capacitive filter, obtain the theoretical values of the DC output voltage and the ripple voltage and compare these values with the measured quantities. Determine also the practical and theoretical values of the ripple factor.
3. Repeat the calculations for the full-wave bridge rectifier and filter circuit.
4. Determine the peak inverse voltage (PIV) on each diode in the three rectifier circuits.
5. If diode D4 in the bridge rectifier circuit of Figure 5 was removed or burned, explain the operation of the circuit in this case and sketch the predicted waveform of the output.
6. Explain the effect of increasing the filter capacitance on the output voltage in the halfwave rectifier and filter circuit.
7. Compare the DC output voltages of the three rectifier circuits. Which circuit has the highest output? On the other hand, which circuit has the lowest peak inverse voltage on each diode?

8. What value of filter capacitor is required to produce 1% ripple factor for a full-wave rectifier having a load resistance of 1.5kΩ? Assume that the peak value of the output voltage is 18V.