Experiment 1
P-N junction diode as a Full wave rectifier.
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Aim

- To study the ripple factor of a full wave rectifier with variable input voltage.

- To study the ripple factor of a full wave rectifier with capacitor filter with variable capacitance and comparing it with theoretical and experimental peak to peak ripple voltage.

Formulae

- $V_{rms} = \sqrt{2}V$

- Ripple factor, $\gamma = \frac{V_{out,ac}}{V_{out,dc}}$

- Ripple Voltage, $V_\gamma = \frac{V_{out,dc}}{RCf}$

- Theoretical Ripple factor $= \frac{1}{4\sqrt{3}RCf}$

Results & Analysis

We have used a ideal diode to do this experiment as the 1N4001 diode gave some error.

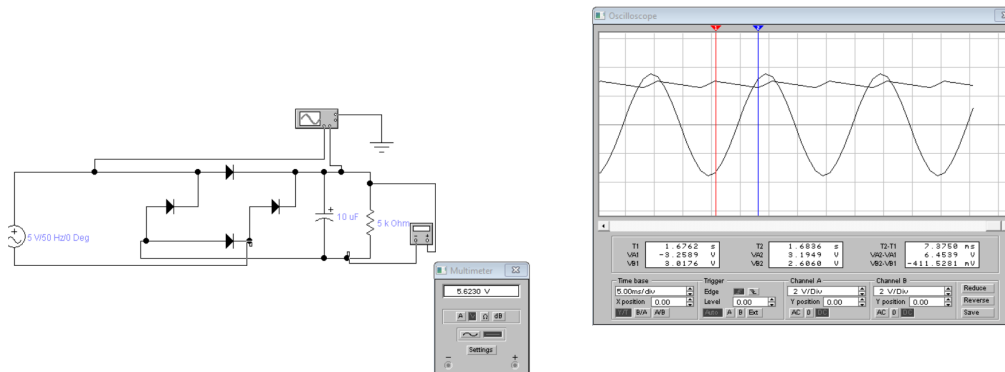**Ripple characteristics with variable input voltage**

Figure 1: Part A

Here we shall pick a $10\mu F$ capacitance and vary the supply.

$V_{in}(volts)$ 50Hz	$V_{out,dc}$	$V_{out,ac}$	Rip fac γ	Rip Vol(ex)	Rip Vol(theo)	Rip fac(theo)
5	5.623	0.2619	0.0465	0.411528	1.12462	0.05773
10	12.35	0.6339	0.0513	0.9261893	2.47	0.057735
20	25.59	1.1966	0.04676	1.9185	5.118	0.057735
30	40.45	1.8933	0.046805	3.0323	8.09	0.057735

Ripple characteristics with variable capacitance

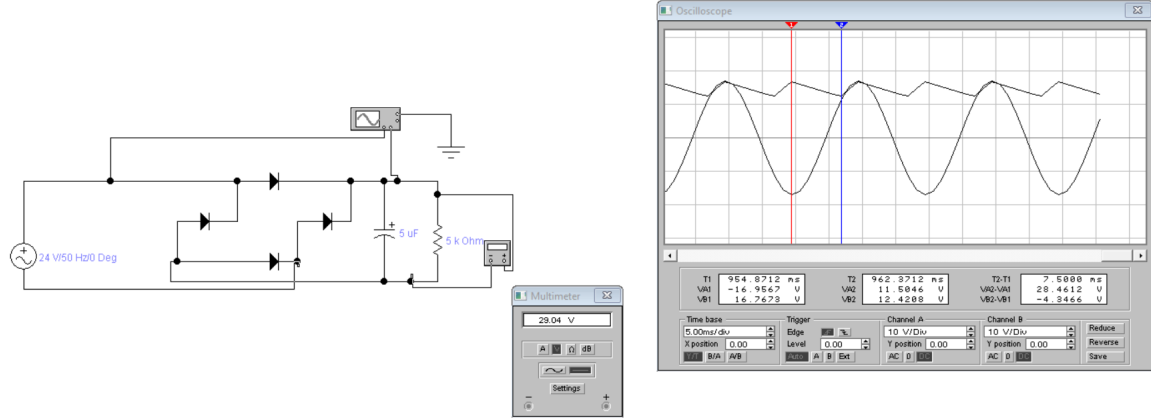We use an ideal diode with 24V AC supply and a 5KΩ Resistor.
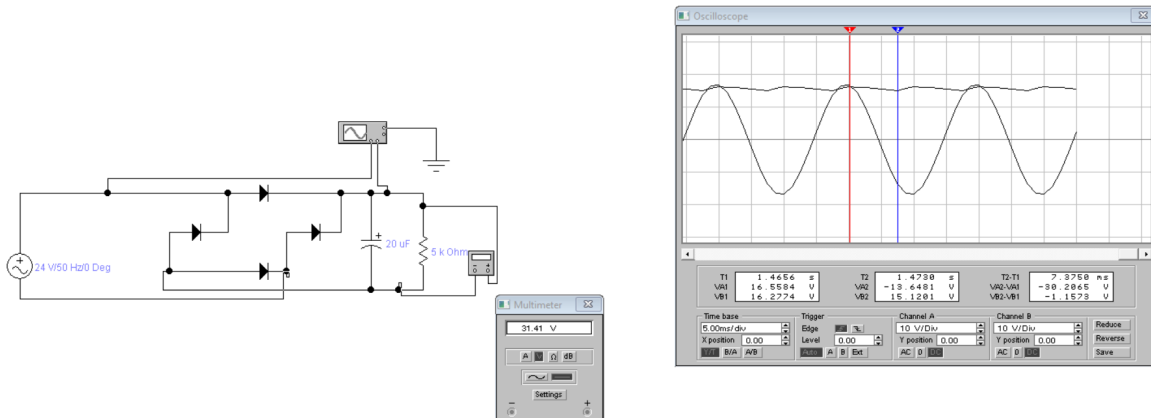

Figure 2: 5 μF Capacitance

Figure 3: 20 μF

Capacitance (μF)	$V_{out,dc}$	$V_{out,ac}$	Rip fac(γ)	Rip Vol(ex)	Rip Vol(theo)	Rip fac(theo)
1	23.2	7.0707	0.30477	10.134	46.4	0.57735
5	29.04	2,713	0.09126	4.3466	9.616	0.11547
10	31.11	1.454	0.04674	2.3316	6.222	0.05773
20	31.41	0.7346	0.0233	1.1573	3.114	0.02886

Conclusion

- The ripple factor does vary with varying supply.

- Ripple factor is also inversely proportional to the capacitance.

- Output voltage frequency is double that of the input voltage.

- There is a larger discrepancy between theoretical and experimental values for smaller capacitance. This might be due to the fact that we assume a small ripple voltage in the formula for calculating these values.