

MP309

Experiment 10

Capacitative Rectification

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Figure 1: Filtering

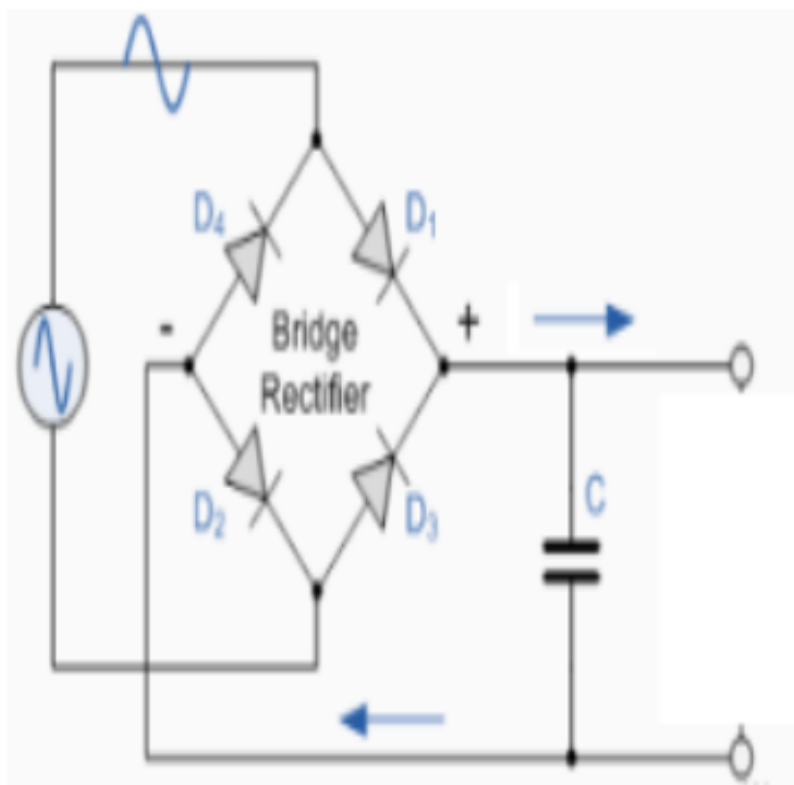


Figure 2: Full Wave Rectification with Filtering

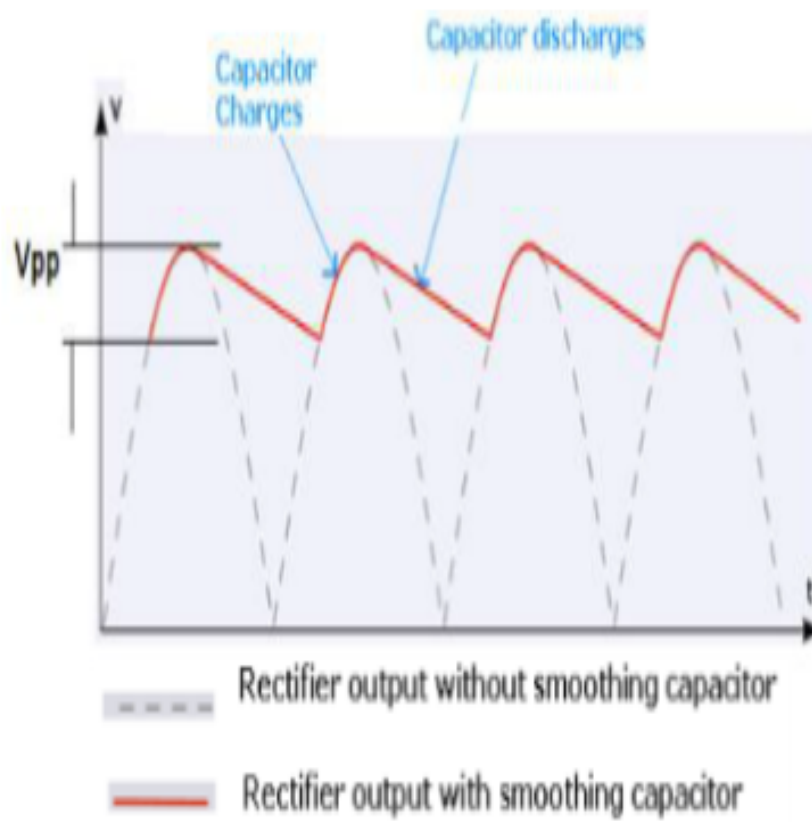


Figure 3: Ripple Voltage and Ripple Factor

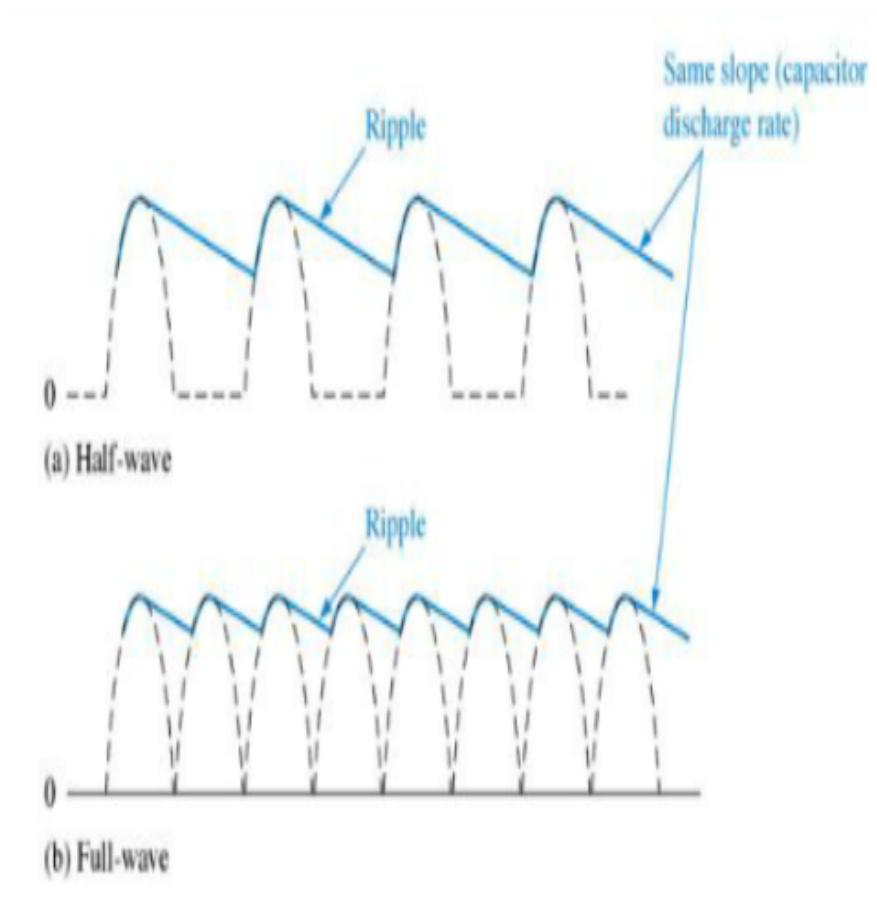


Figure 4: Half Wave vs Full Wave Capacitive Rectification

Capacitive Rectification for Half Wave Rectifier

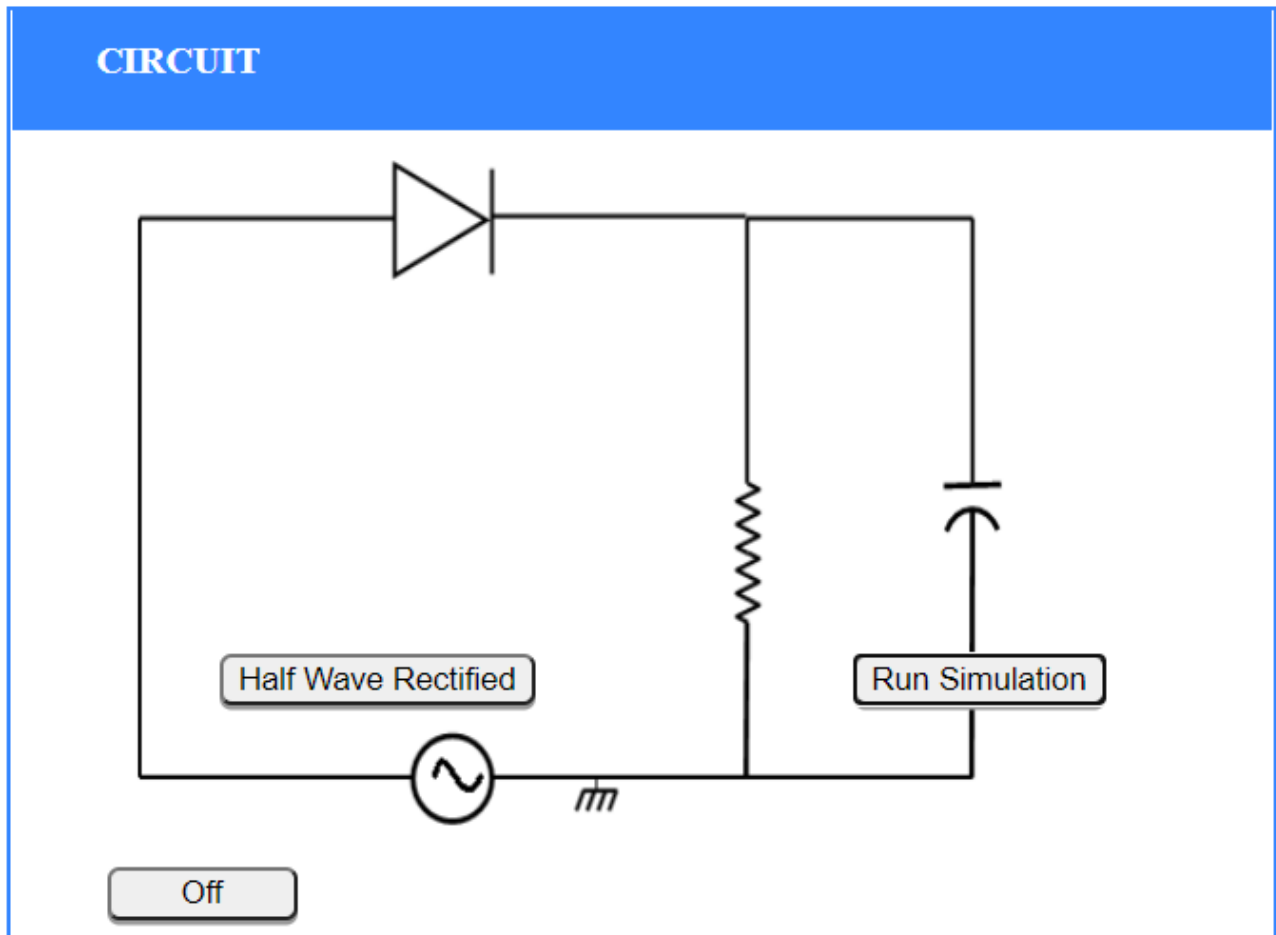




Figure 5: Half Wave Circuit


Parameters


1. Load Resistance (R): - $1\text{K}\Omega$
2. Capacitance (C): - $102\mu\text{F}$
3. AC source: - 50Hz, 2V
4. Channel 1 Input Waveform (in Volt/div): - 1V/div
5. Channel 2 Output Waveform (in Volt/div): - 1V/div
6. Sine wave is used.


CONTROLS


V_{Pch1} :  V


Position Y-Axis: 

Phase:  Deg

Frequency:  Hz

V_{Pch2} :  V

Position Y-Axis: 

Phase:  Deg


Frequency: 

Figure 6: Half Wave Controls

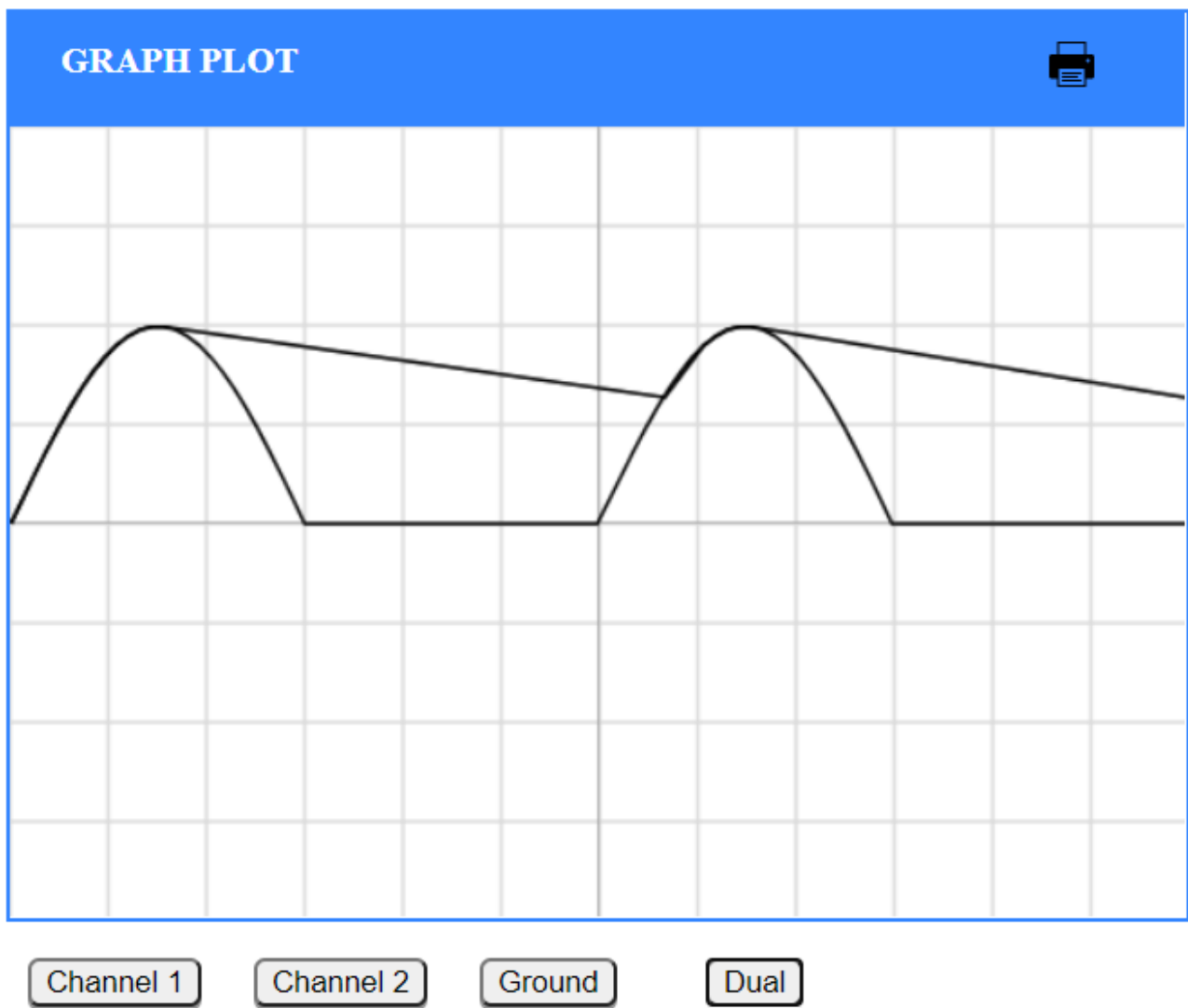



Figure 7: Capacitive Rectification for Half Wave Rectifier Graph

CALCULATION 

Measure the V_m

$$V_{rms} = \frac{V_m}{\sqrt{2}}$$

$$V_{dc} = \frac{V_m}{\pi}$$

$$\text{Ripple Factor} = \frac{V_{ac}}{V_{dc}} \quad \text{Since, } V_{ac} = \frac{\sqrt{(V_{rms}^2 - V_{dc}^2)}}{V_{dc}}$$

Figure 8: Half Wave Capacitive Rectifier Calculations

Capacitive Rectification for Full Wave Rectifier

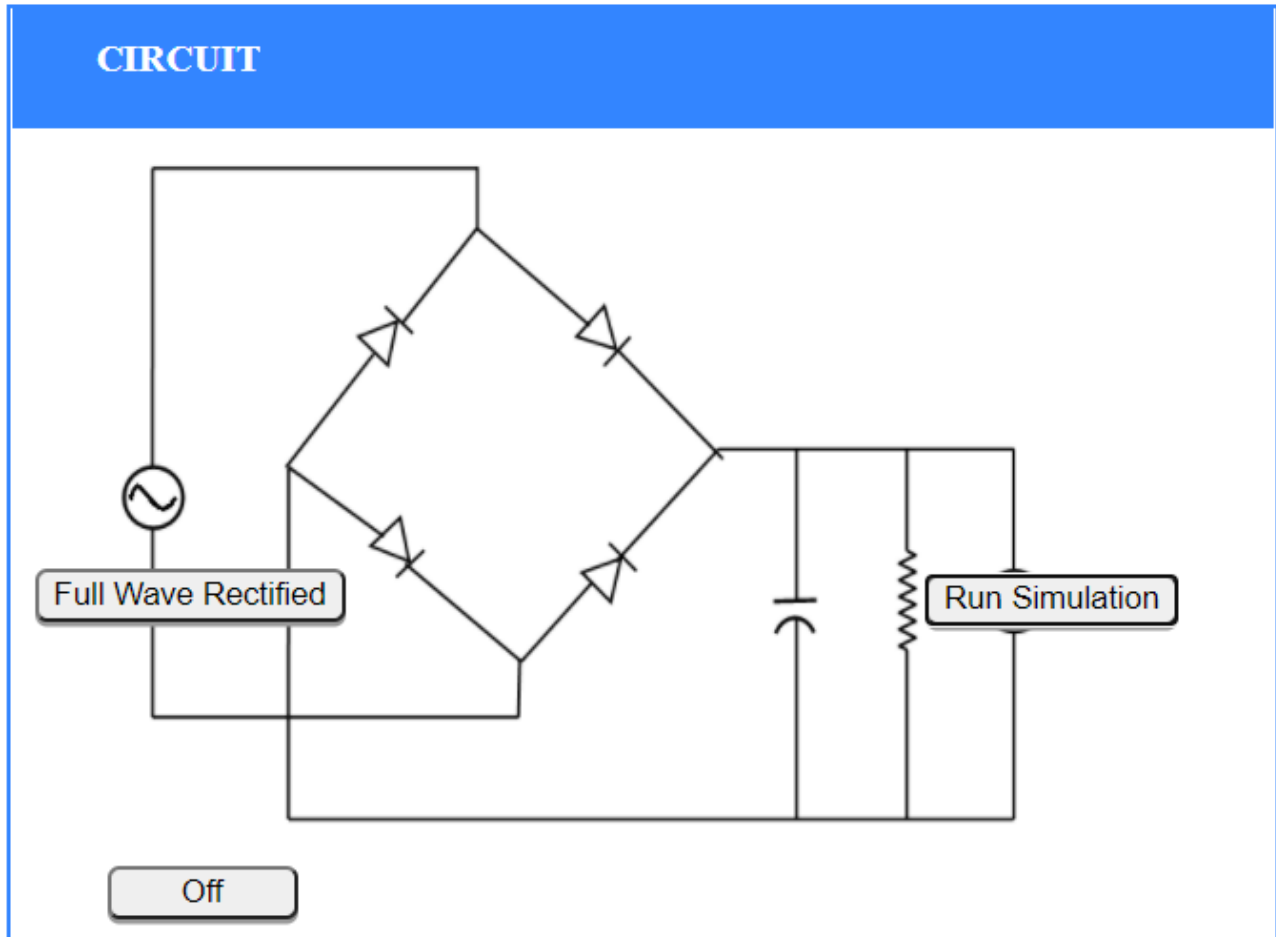



Figure 9: Full Wave Circuit

Parameters

1. Load Resistance (R): - $1\text{K}\Omega$
2. Capacitance (C): - $102\mu\text{F}$
3. AC source: - 50Hz, 2V
4. Channel 1 Input Waveform (in Volt/div): - 1V/div
5. Channel 2 Output Waveform (in Volt/div): - 1V/div
6. Sine wave is used.


CONTROLS

V_{Pch1} :




V

Position Y-Axis:




Phase:




Deg

Frequency:




Hz

V_{Pch2} :




V

Position Y-Axis:



Phase:



Deg

Frequency:




Figure 10: Full Wave Capacitive Rectifier Controls

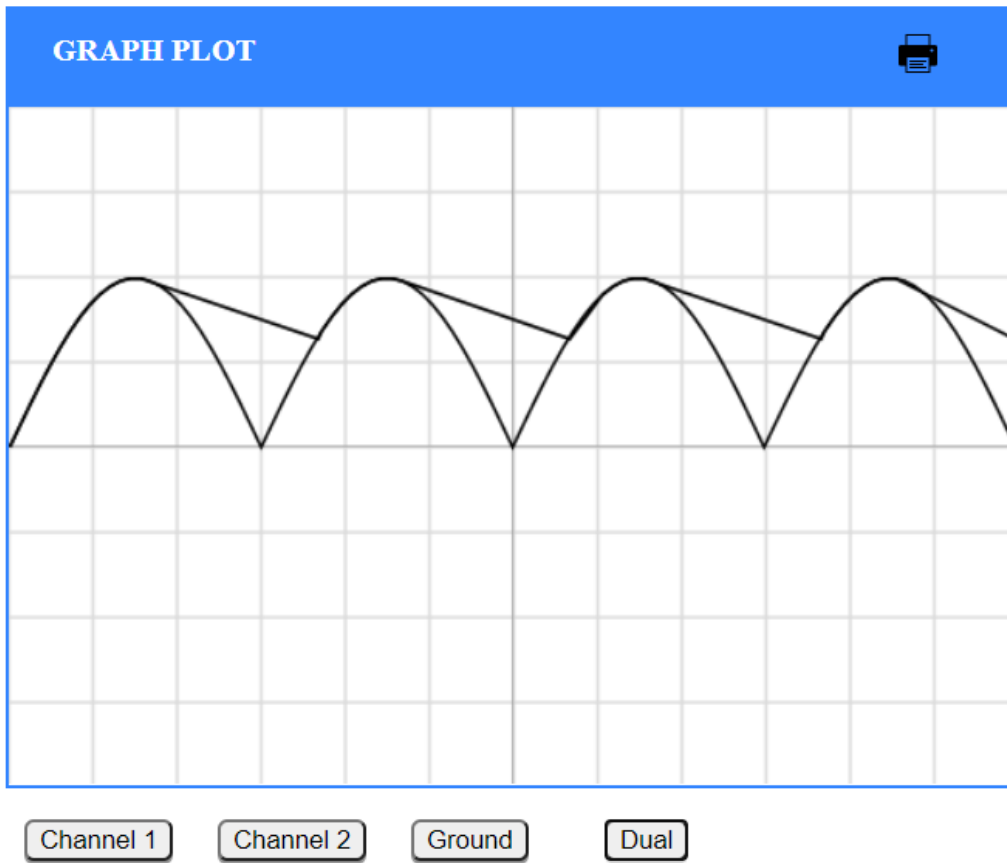


Figure 11: Full Wave Capacitive Rectifier Graph

Calculation

(1) $C=100 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.029$

(2) $C=500 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0058$

(3) $C=1000 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0029$

(4) $C=1500 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0019$

(5) $C=2000 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0014$

(6) $C=2500 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0012$

(7) $C=3000 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0010$

(8) $C=3500 \mu F$, $f = 50Hz$, $R_L = 1K\Omega$

Ripple Factor, $r = \frac{1}{4\sqrt{3}fR_L C} = 0.0008$

Figure 12: Graph for Capacitance v/s Ripple Factor

