NAME - VISHAL KUMAR,

ROLL - 19/ECE/185

University Roll NO. - 00319185

sub-code - EC-492

Experiment - 1

Aim :- To study the Performance of a half wave rectifier circuit using simple diode (IN4007) with without capacitor filter.

objectives :-

a). To design the circuits.

b). observe the output waveform of the rectifier on the cathode ray oscillator (CRO) with & without filter capacitor (10 uf) across the load resistor R_L (10 K Ω)

c). calculate the value of Ripple factor (R.F) with & without capacitor filter & realize the best performance of the rectifier output.

d). Draw the rectifier input and output wave form on the milimeter graph paper.

Component required :-

a) ONE diode PN junction IN4007

b) one load resistance $R_L = 10 k\Omega$

c) one capacitor (Eletrolytic 10 uf)

d) Bred Board connecting wires.

Vishal kumar

Instrument required

a). Trainer kit

b). CRO or Cathode ray oscilloscope.

Theory :- The process of converting an a.c into direct current is known as rectification. The undirectional conduction property of semi conductor diodes (junction diodes) is used for rectification.

The undirectional conduction property of semiconductor property of diodes (junction diode) is used for rectification.

In a half wave rectifier during (+ve) half cycle of input the diode is forward biased & conducts. Current flows through load & voltage dveloped. During (-ve) half cycle. it is reverse bias & close not conduct. Therfore no current flows & no voltage is developed. Thus dc voltage across load is for first cycle only and is converted into unidirectional pulsating output signal..

$$V_{dc} = \frac{V_{max}}{\pi} = 0.318\, V_{max}$$

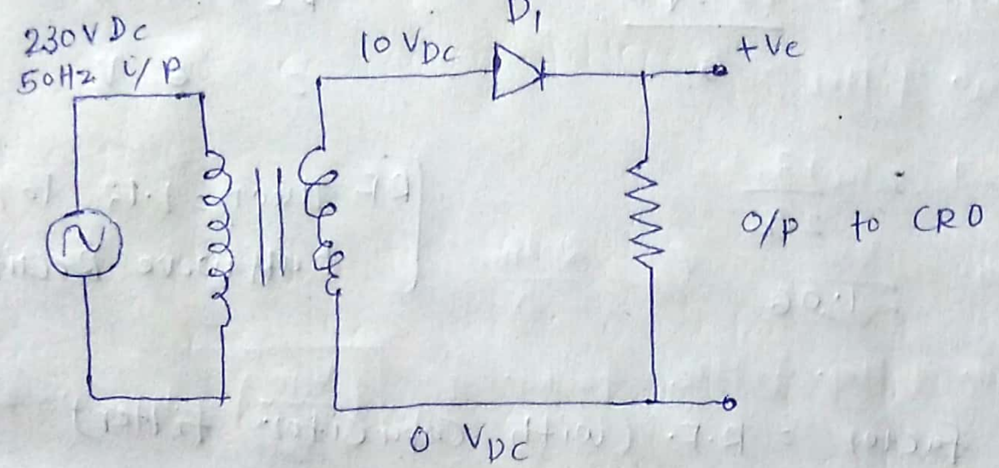
Ripple factor :- It is the measure of purity of dc output of a rectifier.

$$r = \left.\frac{V_{ac}}{V_{dc}}\right|_{output} = \sqrt{\frac{V_{rms}^2 - V_{dc}^2}{V_{dc}^2}} = \sqrt{\left(\frac{0.5}{0.318}\right)^2} = 1.21$$

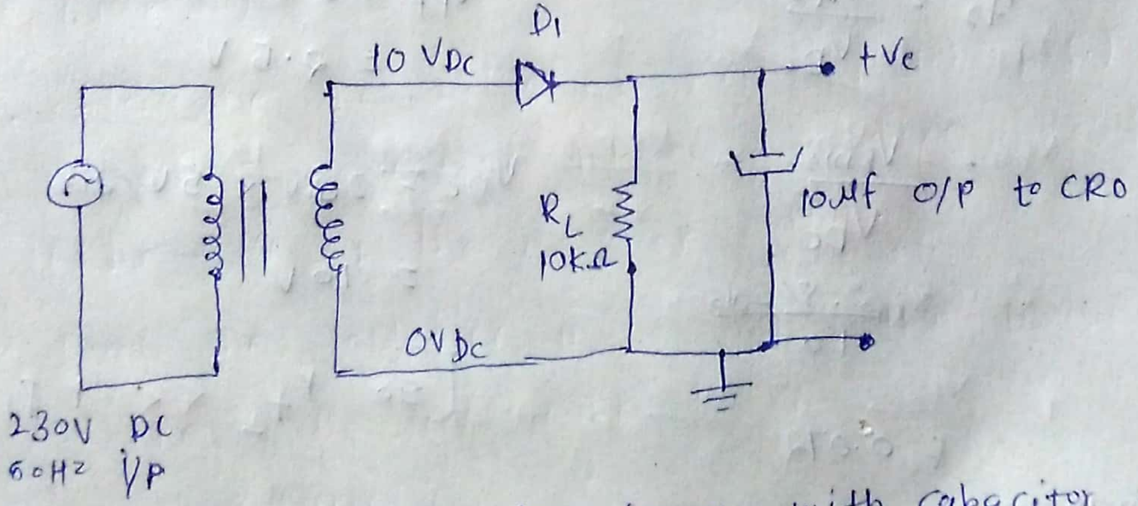
Vishal Kumar

Felters :- when rectifiying an alternating Voltage. we wish to produce a steady direct voltage free from any voltage variation or ripple. various filter Ckt. such as Capacitor filter is used across the O/P making the component to pass through load recuritis in small ripple voltage.

Circuit Diagram :-



without Capicitor Ckt



stepdown transformer with capacitor Ckt

Calculation :-

Ripple factor = R.F. (without capacitor filter)

$= \frac{V_{AC}}{V_{DC}}$ ∴ $V_{rms} = \frac{V_{PP}}{2\sqrt{2}}$

$V_{PP} = 3\,div \times 5\,V/div$

$= 15$ volt

$= \frac{V_{rms}}{V_{DC}}$

$= \frac{15\ 2\sqrt{2}}{5}$

$V_{DC} = 1\,div \times 5\,V/div$

$= 6\ V$

$= \frac{3}{2\sqrt{2}}$

$= 1.06$

[RF Theory = 1.12 for halfwave Rectifier]

Ripple factor = R.F. (with capacitory filter)

$r_{f_2} = \frac{V_{AC}}{V_{DC}}$

$V_{PP} = 0.5\,div \times 5\,V/div$

$= 2.5\ V$

$= \frac{V_{rms}}{V_{DC}}$

$V_{DC} = 2\,div \times 5\,V/div$

$= 10\ V$

$= \frac{2.5/2\sqrt{3}}{10}$

[so $r_{f_2} << r_{f_1}$]

$= 0.072$

Conclusion :- when we need the capacitor filter the ripple factor with be very less, more charging the capacitor value gives the smooth o/p dc waveform i.e. ripple factor will be minimized so. we obtain better recifier efficiency.

Vishal Kumar

Experiment 2.

Title :- Study of ripple characterstics of full wave rectifier with and without capacitor filter.

objective :- To find the ripple factor of full wave rectifier with & without capacitor.

Theory :- The circuit of centre topped full wave rectifier uses two Diode D_1 & D_2. During (+ve) half cycle of the secondary voltage (i/p voltage of the) diode D_1 is Forward biased and D_2 is reversed biased. As a result the Diode D_1 conducts and current flows throgh the load R_l. During (-ve) half cycle of the i/p voltage of diode D_2 becomes Forward biased and current flows throgh the load for the entire cycle of i/p signal.

component and equipment required :-

a). Experiment board.

b). Transformer (6-0-6)

c) PN - diodes (IN4007)

d) multimeters

e) capacitor (100 μF)

f) Resistor (1 kΩ)

Vishal Kumar - 19/ECE/185

Observation Table :-

	filter	V_{ac} (V)	V_{dc} (V)	practical $r = \frac{V_{rms}}{V_{dc}}$	Theoritical r	% error
using DMM	without filter	13	8	0.57	0.482	18.25
	with filter	14	11	0.036	0.028	28.57

Calculations :-

without filter :-

Theoritical calculation :-

$V_{rms} = \frac{V_m}{\sqrt{2}}$, $V_{dc} = \frac{2V_m}{\pi}$

without filter ripple factor $r = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1} = 0.482$

Practical Calculations

$V_{pp} = 13$, $V_{dc} = 8$

$$V_{rms} = \frac{V_m}{\sqrt{2}} = \frac{V_{pp}/2}{\sqrt{2}} = \frac{V_{pp}}{2\sqrt{2}} = \frac{13}{2\sqrt{2}}$$

$$\therefore V_{rms} = 4.59$$

$$r = \frac{V_{rms}}{V_{dc}} = \frac{4.59}{8} = 0.57$$

$$\% \text{ error} = \left| \frac{r_{theo} - r_{prac}}{r_{theo}} \right| \times 100\%$$

$$= 18.25\%$$

VISHAL KUMAR - 19/ECE/185

with filter :-

Theoritical calculation :-

$f = 50Hz$, $C = 100\mu F$, $R_L = 1k\Omega$

ripple factor $= r = \dfrac{1}{4\sqrt{3} f C R_L} = 0.0288$

Practical calculations :-

$$V_{rms} = \frac{V_m}{\sqrt{3}} = \frac{V_{pp}}{2\sqrt{3}} = \frac{1.9}{2\sqrt{3}} = 0.404$$

$$V_{prac} = \frac{V_{rms}}{V_{dc}} = \frac{0.404}{11} = 0.036$$

$$\% \text{ error} = \left| \frac{r_{theo} - r_{prac}}{r_{theo}} \right| \times 100\% = 28.57\%$$

Precautions :-

a). Reading must be taken carefully.

b). All the connection must be properly connected

c). observation must be taken carefuly from CRO.

Conclusion :- Here is the Centere tapped with full wave rectifier we use 10volt, 0 volt, 20 volt. we use two diode from forward bias & reverse bias. The cycle is (+ve) half cycle without filter is same sino wave, so we use $V_{rms} = \frac{V_0}{\sqrt{2}}$. but in with filter it is triangular wave, so we use $V_{rms} = V_m/\sqrt{3}$. The error is calculation of ripple factor without filter is 18.25% and with filter is 28.57%