Indian Institute of Information Technology, Allahabad
Department of Electronics and Communication Engineering

Course Name: Electronics Measurement and Instrumentation

EXPERIMENT NO: 03

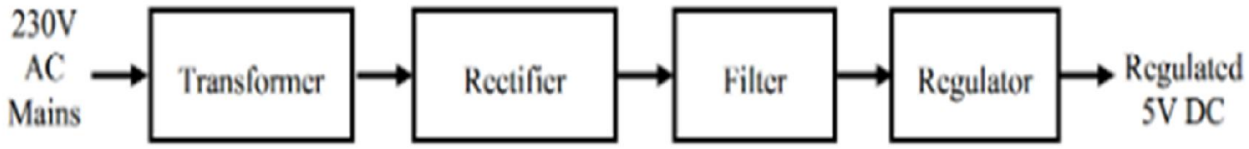
Objective: To study about center tapped full wave rectifier with and without filter.

Materials Required:
Function generator, Digital Storage Oscilloscope (DSO), 9-0-9 Transformer, Regulated DC power supply, Bread Board, Resistance (1kΩ), Capacitor (10μF), Diodes (1N4007), Connecting wires.

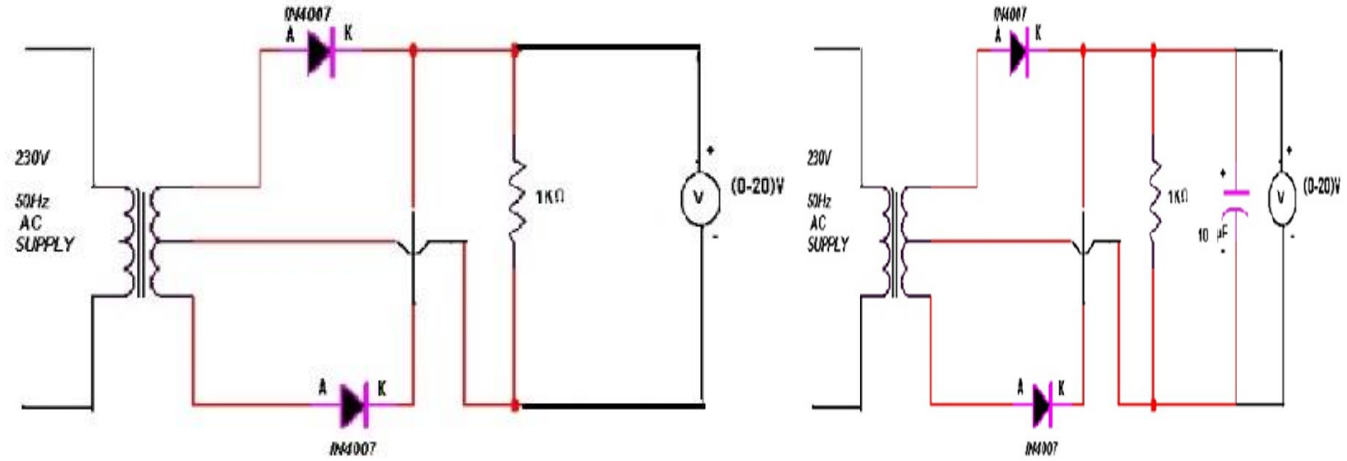
Theory:
The conversion of AC into DC is called rectification. Electronic devices can convert AC power into DC power with efficiency.

Full wave rectifier:
Find out V_{dc} and V_{rms} by calculation and practically using formula for without filter as:
$V_{dc} = 2Vp/\pi$ and $V_{rms}=V_m/\sqrt{2}$. And find out the Ripple factor (r) $=\frac{Vac}{Vdc} = \sqrt{(Vrms/Vdc)^2}-1$
Find out V_{rms} and ripple factor (r) using formula for full wave rectifier with filter as:
$V_{rms}= Vr_{p-p}/4\sqrt{3}$ and ripple factor (r) $=1/ (4\sqrt{3}\, f\, R_L C)$, where Vr_{p-p} is peak to peak ripple voltage.
Find out efficiency by formula $(\eta) = (V_{dc}/V_{ac})^2$, where V_{ac} is nothing but V_{rms} of full wave rectifier.

Block Diagram:



Circuit Diagram:
Center tapped full wave rectifier:



(a) Without filter **(b) With filter**

Observation tables :

1. Center tapped Full wave rectifier (without filter):

V_{p-p} (input voltage) (V)	V_m (Peak voltage) =Vp-p/2 (V)	V_{dc} (V)	Vrms $=V_m/\sqrt{2}$ (V)	Ripple factor		Efficiency (experimently)	
				Theoretical	Experimental	Theoretical	Experimental
29.6	14.8	8	10.46	0.48	0.84	81%	58%

2. Center tapped Full wave rectifier (with filter) :

V_{p-p} (input voltage) (V)	Vrp-p (peak to peak ripple voltage) (V)	V_m (Peak voltage) (V)	V_{dc} (V)	Vrms = Vrp-p/4√3 (V)	Ripple factor	
					Theoretical	Experimental
6.40	6.40	13.2	10.20	0.92	0.288	0.090

Calculation :

Theoretical calculation (without filter) :

Ripple factor = $\sqrt{(V_{rms}/V_{dc})^2-1}=\sqrt{(V_m/\sqrt{2}/2V_m/\Pi)^2-1} = 0.48$

Effieiency = $(V_{dc}/V_{rms})^2 = (2V_m/\Pi/ V_m/\sqrt{2})^2=0.81X100= 81\%$

Experimental calculation(without filter):

Ripple factor = $\sqrt{(Vrms/Vdc)2-1} = \sqrt{(10.46/8)^2-1} =0.84$

Efficiency = $(V_{dc}/V_{rms})^2 = (8/10.46)^2= 0.58X100 = 58\%$

Theoretical calculation (with filter) :

Ripple factor = $1/ (4\sqrt{3}\ f\ R_L C) =1/4\sqrt{3}X\ 50X\ 10^3X10X10^{-6}= 0.288$

Experimental calculation (with filter) :

Ripple factor = $V_{rms}/V_{dc} =0.92/10.20 =0.090$

Graph :

Trace the Input and Output waveform of center tapped full rectifier with without and filter observed in DSO**.**

Results: We have studied the center tapped full wave rectifier with filter and without filter and we found the experimental value of ripple factor of center tapped full wave rectifier without filter and with filter and experimental value of the efficiency of center tapped full wave rectifier without filter.

		Center tapped Full wave rectifer
Ripple factor	Without filter	0.84
	with filter	0.09
Efficiency	Without filter	58%

Precautions:

(a) Connections should be verified before clicking run button.

(b) Check the components before use.

(c) The resistance to be chosen should be in K ohm range.