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

Course Name: Electronics Measurement and Instrumentation

EXPERIMENT NO: 02

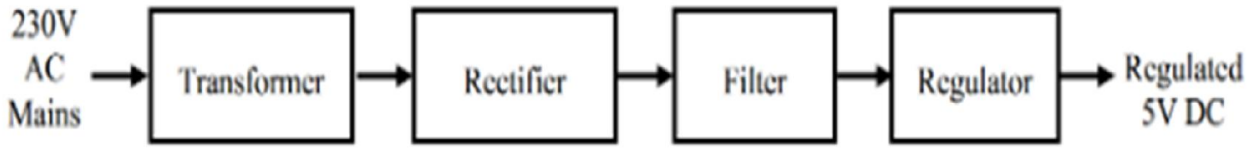
Objective: To study about half wave rectifier with and without filter.

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

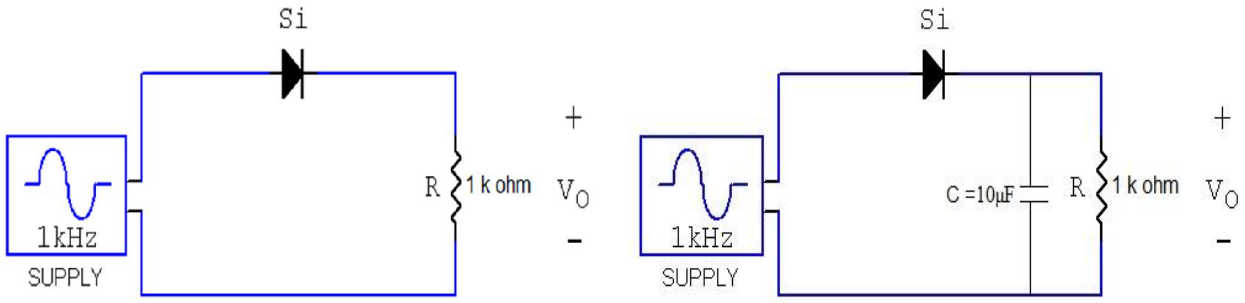
Theory:
The conversion of AC into DC is called rectification. Electronic devices can convert AC power into DC power with efficiency.

Half wave rectifier:
Find out V_{DC} and V_{rms} by calculation and practically using formula for without filter as:
$V_{dc} = Vp/\pi$ and $V_{rms}=V_m/2$. 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 half wave rectifier with filter as:
$V_{rms}= Vr_{p-p}/2\sqrt{3}$ and ripple factor (r) $=1/ (2\sqrt{3}\, f\, R_L C)$, 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 half wave rectifier.

Block Diagram:



Circuit Diagram:
Half wave rectifier:



(a) without filter **(b) with filter**

Observation tables :

1. Half wave rectifier (without filter):

V_{p-p} (input voltage) (V)	V_m (Peak voltage) =Vp-p/2 (V)	V_{dc} (V)	Vrms $=V_m/2$ (V)	Ripple factor		Efficiency (experimently)	
				Theoretical	Experimental	Theoretical	Experimental
56	28	11.2	14	1.21	0.75	40.5%	64%

2. Half wave rectifier (with filter) :

V_{p-p} (input voltage) (V)	Vr_{p-p} (peak to peak ripple voltage) (V)	V_m (Peak voltage) =Vp-p/2 (V)	V_{dc}= V_m- $Vr_{p-p}/2$ (V)	Vrms = Vrp-p/2√3 (V)	Ripple factor	
					Theoretical	Experimental
56	21.20	28	17.4	6.12	0.577	0.351

Calculation :

Theoretical calculation (without filter) :

Ripple factor = $\sqrt{(V_{rms}/V_{dc})^2-1}=\sqrt{(V_m/2/V_m/\Pi)^2-1}$ = 1.21.

Effieiency = $(V_{dc}/V_{rms})^2 = (V_m/\Pi/ V_m/2)^2$=0.405X100= 40.5%.

Experimental calculation (without filter):

Ripple factor = $\sqrt{(V_{rms}/V_{dc})^2-1}$ = $\sqrt{(14/11.2)^2-1}$ =0.75

Efficiency = $(V_{dc}/V_{rms})^2 = (11.2/14)^2$= 0.64X100 = 64%

Theoretical calculation (with filter) :

Ripple factor = $1/ (2\sqrt{3}\ f\ R_L C) = 1/2\sqrt{3}X\ 50X\ 10^3X10X10^{-6}$= 0.577

Experimental calculation (with filter) :

Ripple factor = V_{rms}/V_{dc} =6.12/17.4=0.351

Graph :

Trace the Input and Output waveform of half wave rectifier without and with filter observed in DSO**.**

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

		Half wave rectifer
Ripple factor	Without filter	0.75
	with filter	0.351
Efficiency	Without filter	64%

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.