GOVERNMENT ARTS AND SCIENCE COLLEGE NADAPURAM
DEPARTMENT OF PHYSICS
SECOND SEMESTER EXPERIMENTS- ELECTRONICS 1

LIST OF EXPERIMENTS

1. **A) Study the V-I characteristics of diodes. Characteristics Si diodes, and LEDs .**

   B) Reverse characteristics – Si diode;

   ● ExpEYES may be used. https://expeyes.in/experiments/electronics/diodeIV.html

   ● Optional: Plot and fit the experimental data with the diode equation in GeoGebra or any other application and calculate the value of the ideality factor of the PN junction.

2. **Study the characteristics of Zener diode and construct a voltage regulator.**

   ● Study the V-I characteristics of zener diode and hence determine the breakdown voltage.

   ● https://expeyes.in/experiments/electronics/zenerIV.html

   ● Construct a voltage regulator using a zener diode and determine the percentage of voltage regulation.

3. **Construction of the Half Wave Rectifier.**

   ● Construct a half wave rectifier. Breadboard may be used for the easy replacement of the filters.

   ● Observe the waveforms without filter and with filter capacitors of four different values (4.7uF, 10uF, 47uF, 100uF) at constant load resistance using CRO/ExpEYES. Measure the voltages and calculate the ripple factor.(load constant, capacitor change)

   ● Observe the variation of the ripple factor with load resistance (capacitor constant and load changes, for three capacitors)

4. **Construction of the center tapped full wave rectifier and regulated power supply.**

   ● Construct a center tapped full wave rectifier without filter and with a filter.

   ● Observe the waveforms without filter and with filter capacitors of four different values (4.7uF, 10uF, 47uF, 100uF) at constant load resistance using CRO/ExpEYES. Measure the voltages and calculate the ripple factor.(load constant, capacitor change)

   ● Observe the variation of the ripple factor with load resistance (capacitor constant and load changes, for three capacitors)

5. **Construction of the Bridge rectifier.**

   ● Construct a bridge rectifier. Bread board may be used for the easy replacement of the filters.

- Observe the waveforms without filter and with filter capacitors of four different values (4.7uF, 10uF, 47uF, 100uF) at constant load resistance using CRO/ExpEYES. Measure the voltages and calculate the ripple factor.(load constant, capacitor change)
- Observe the variation of the ripple factor with load resistance (capacitor constant and load changes, for three capacitors)

6. **Construction of voltage multiplier (Doubler and Tripler).**
    - Construct the voltage doubler and tripler using diodes and capacitors
7. **Construction of LCR series circuit and obtain resonant frequency**

Experiment-1

PN Junction diode characteristics A) Forward bias B) Reverse bias

AIM: 1. To plot Volt-Ampere Characteristics P-N Junction Diode.

APPARATUS:

S.No	Name of the Apparatus	Range	Quantity
1	Diodes IN 4007 (Ge and Si)		1
2	Resistors	1KΩ, 100Ω	1
3	Regulated Power Supply	(0-30)V DC	1
4	Bread Board		1
5	Digital Ammeter	(0-200)µA/(0-200)mA	1
6	Digital Voltmeter	(0-20)V DC	1
7	Connecting Wires	As Required	

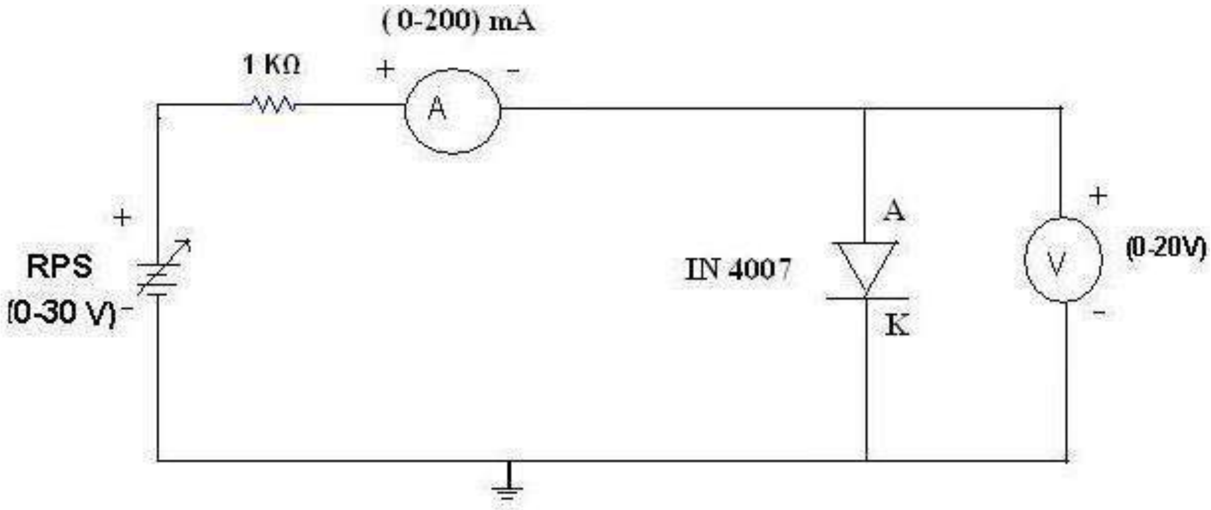
THEORY:-

A p-n junction diode conducts only in one direction. The V-I characteristics of the diode are curve between voltage across the diode and current through the diode. When external voltage is zero, circuit is open and the potential barrier does not allow the current to flow. Therefore, the circuit current is zero. When P-type (Anode is connected to +ve terminal and n- type (cathode) is connected to –ve terminal of the supply voltage, is known as forward bias. The potential barrier is reduced when diode is in the forward biased condition. At some forward voltage, the potential barrier altogether eliminated and current starts flowing through the diode and also in the circuit. The diode is said to be in ON state. The current increases with increasing forward voltage.

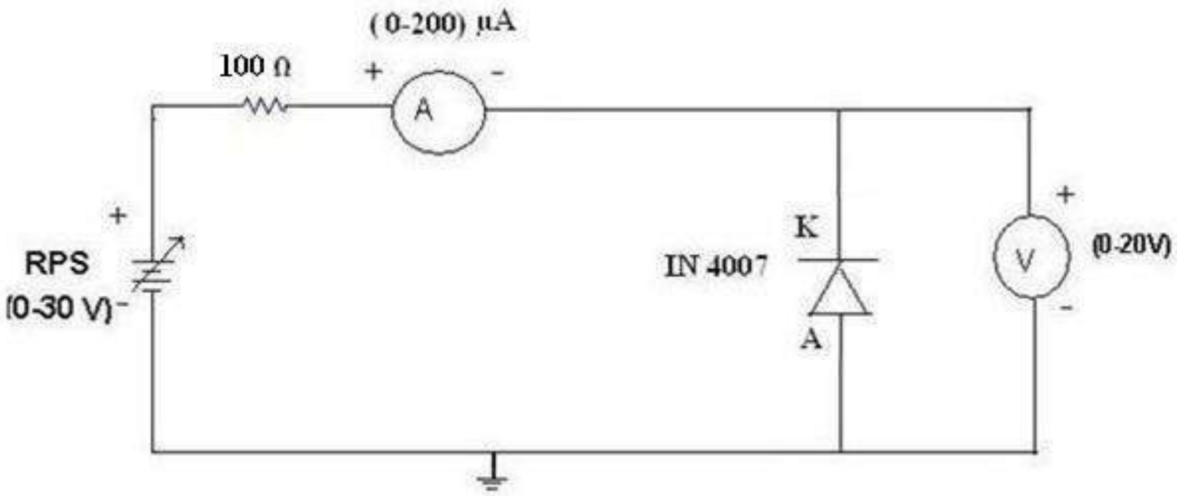
When N-type (cathode) is connected to +ve terminal and P-type (Anode) is connected to –ve terminal of the supply voltage is known as reverse bias and the potential barrier across the junction increases. Therefore, the junction resistance becomes very high and a very small current (reverse saturation current) flows in the circuit. The diode is said to be in OFF state. The reverse bias current due to minority charge carriers.

CIRCUIT DIAGRAM:

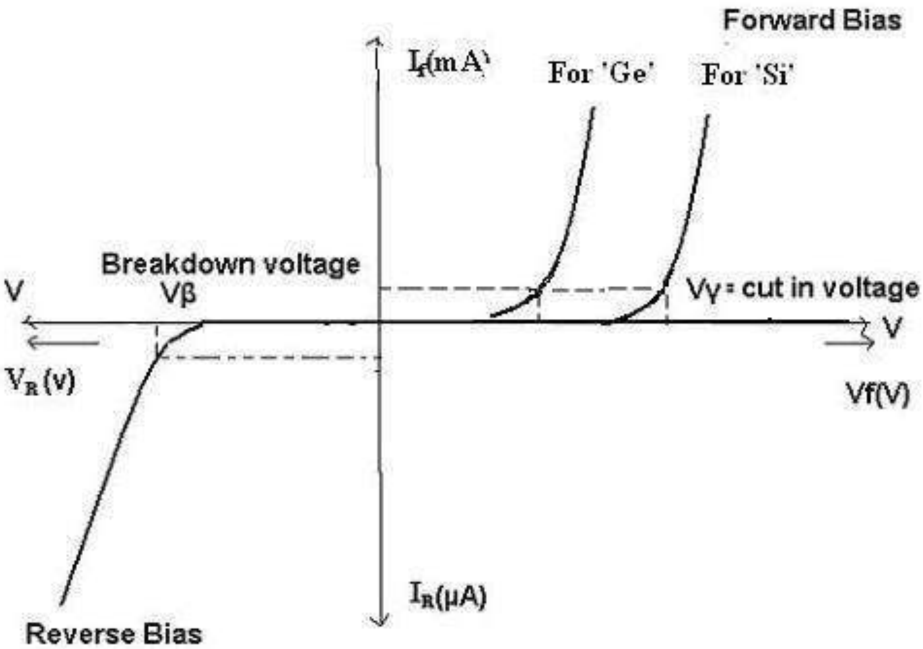
(i) FORWARD BIAS:



(ii) REVERSE BIAS:



V-I CHARACTERISTICS:



PROCEDURE:

(i) FORWARD BIAS (For 'Ge' and 'Si' Diode):

1. Connections are made as per the circuit diagram.
2. For forward bias, the RPS +ve is connected to the anode of the diode and RPS –ve is connected to the cathode of the diode,
3. Switch ON the power supply and increases the input voltage (supply voltage) in Steps.
4. Note down the corresponding current flowing through the diode and voltage across the diode for each and every step of the input voltage.
5. The readings of voltage and current are tabulated.
6. Graph is plotted between voltage on x-axis and current on y-axis.

OBSERVATIONS:

Forward Bias:

S.No.	Applied voltage (volts)	Voltage across Diode (volts)	Current through Diode (mA)

PROCEDURE:

(ii) REVERSE BIAS :

1. Connections are made as per the circuit diagram.
2. For reverse bias, the RPS +ve is connected to the cathode of the diode and RPS –ve is connected to the anode of the diode.
3. Switch ON the power supply and increase the input voltage (supply voltage) in Steps.
4. Note down the corresponding current flowing through the diode and voltage across the diode for each and every step of the input voltage.
5. The readings of voltage and current are tabulated.
6. The Graph is plotted between voltage on x-axis and current on y-axis.

OBSERVATIONS:

REVERSE BIAS

S.No.	Applied voltage (volts)	Voltage across Diode (volts)	Current through Diode (µA)

PRECAUTIONS:

1. While doing the experiment do not exceed the ratings of the diode. This may lead to damage the diode.
2. Connect voltmeter and Ammeter in correct polarities as shown in the circuit diagram.
3. Do not switch **ON** the power supply unless you have checked the circuit connections as per the circuit diagram.

RESULT: The Forward and Reverse Bias characteristics for a p-n diode are observed

Experiment No. 19(a)

STUDY THE CHARACTERISTICS OF LED (3 COLOURS)

Aim

To plot the V-I characteristics of an LED.

Apparatus

LEDs, resistors, rheostat, voltmeter (0 - 5V), ammeter (0 - 100mA) bread board and a dc power supply (0 - 10V).

Theory

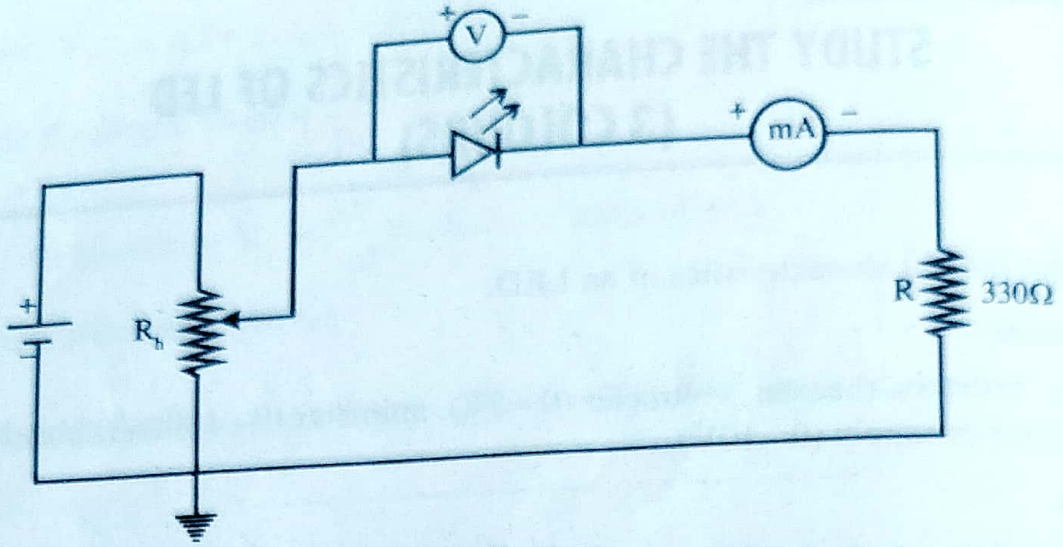
Light emitting diode (LED) is a semiconductor which emits light when it is forward biased. The colour of emitted light depends upon the composition of the semiconductor material used for its construction. The V - I characteristics of LDR is similar to that of a PN junction diode. Most LEDs have low reverse break down voltage ratings, hence they may be damaged when reverse volt age of more than a few volts is applied. Most of the LEDs have a forward voltage of 1.6V to 3.5V and a current of 20mA to 35mA.

Static and dynamic resistances of LED

When the diode is forward biased, it offers a finite resistance in the circuit. The static resistance or dc resistance is the ratio of dc voltage across the LED to the dc current flowing through it. The dynamic resistance or ac resistance of the diode at any point is the reciprocal of the slope of the characteristic curve at that point.

$$\text{Dynamic resistance} = \frac{\text{Change in voltage}}{\text{Resulting change in current}}$$

$$= \frac{\Delta V}{\Delta I}$$

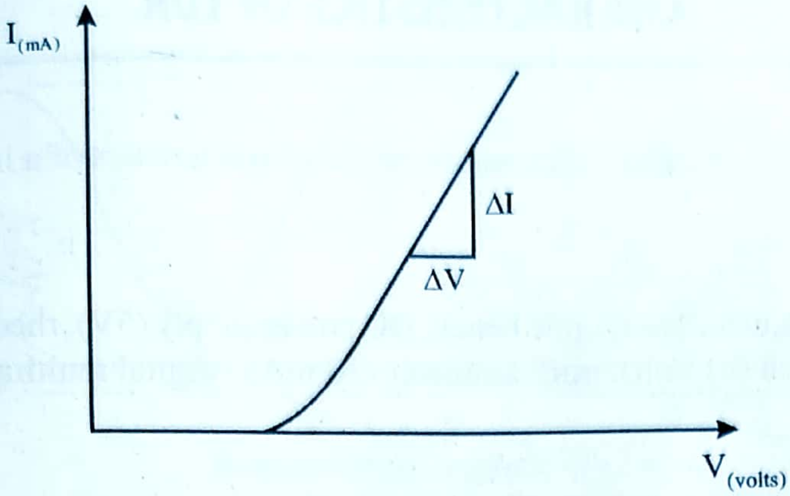


Connection diagram

Observations and tabulations

Trial No.	LED colour	Voltmeter reading (Volts)	Ammeter reading (mA)
1	Red		
2			
3			
4			
5			
1	Green		
2			
3			
4			
5			
1	Yellow		
2			
3			
4			
5			

V - I Characteristic



rocedure

First of all identify the anode and cathode terminals of the LED. Make the nnections on the bread board as shown in figure below. Vary the rheostat and take e readings of the voltmeter and ammeter. Take at least five sets of readings. Repeat e above steps for different colour LEDs.

Draw a graph between voltage along the horizontal axis and current along the rtical axis we get a graph as shown in figure. To measure the forward static sistance consider a point on the characteristic curve and note the corresponding ltage and current. The ratio of the voltage to the current gives the static resistance. measure the dynamic forward resistance for a particular dc current, find out the ciprocal of the slope ($\tan\theta$) of the forward characteristic curve at the point rresponding to that current.

esult

(i) The variation of current with voltage has been studied.

(ii) Static forward resistance at 20mA = ----------- Ω

(iii) Dynamic forward resistance at 20mA = --------- Ω

Experiment No. 2(a)

ZENER DIODE CHARACTERISTICS

Aim

To plot the V-I characteristic curves of a Zener diode and determine its reverse breakdown voltage, its static and dynamic resistances

Components and equipments required

Sl. No.	Component/Equipment	Specification	Quantity
1	Zener diode	SZ 5.6	1 No
2	Resistor	120Ω	1 No
3	Voltmeter	0 - 20V	1 No
4	Ammeter	0 - 10 mA	1 No
5	Regulated power supply	DC 0 - 10V	1 No
6	Bread board		

Theory

Zener diode is a heavily doped p-n junction diode, specially made to operate i the breakdown region. A p-n junction diode normally does not conduct when it reverse biased. But if reverse bias is increased at a particular voltage it star conducting heavily. This voltage is called breakdown voltage. Zener diode has sharp breakdown voltage and it conducts in the reverse direction at this voltage.

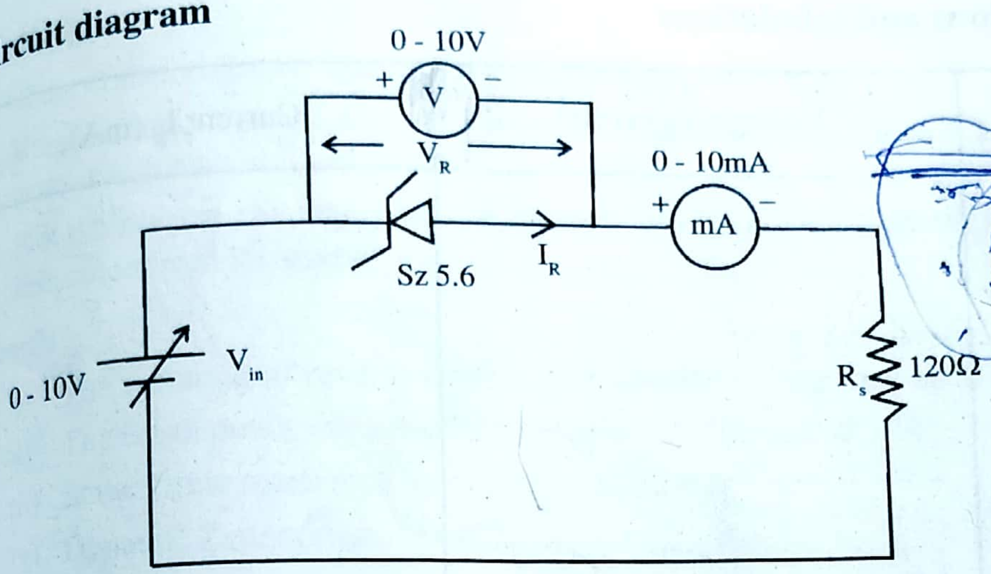
Static resistance of zener diode is the ratio of dc voltage to the dc current flowi through it.

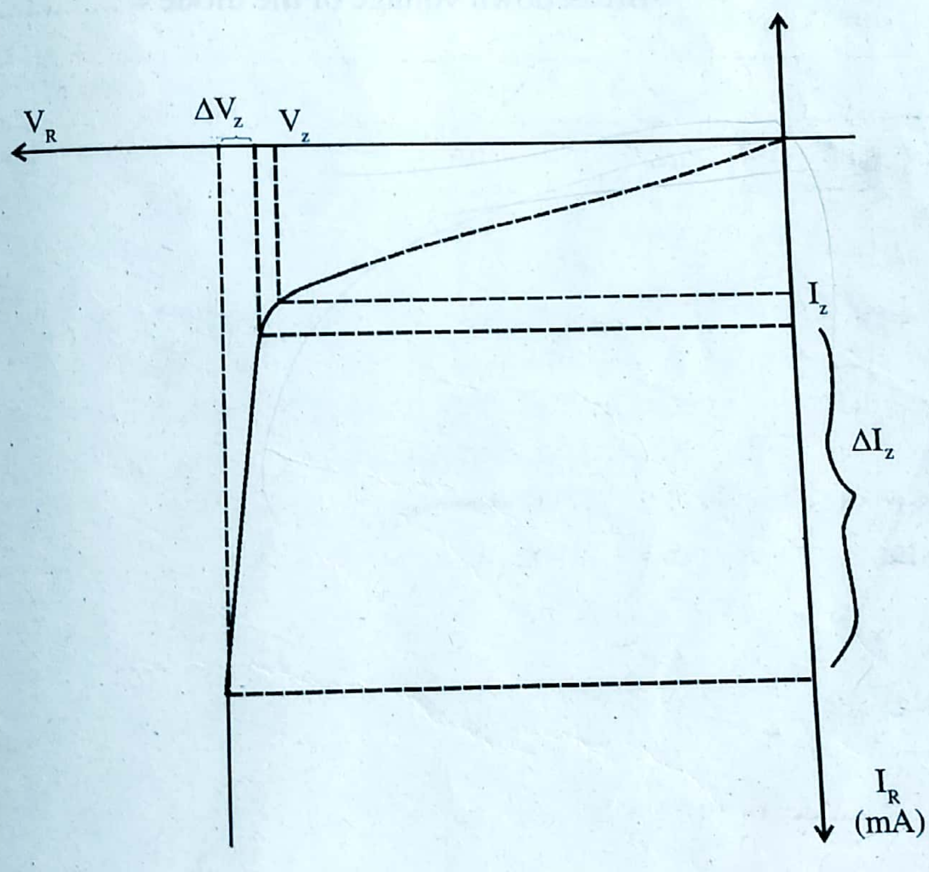
$$\text{Static resistance} = \frac{V_z}{I_z}$$

Dynamic resistance is the reciprocal of the slope of the characteristic cur

$$\text{Dynamic resistance} = \frac{\Delta V_z}{\Delta I_z}.$$

Circuit diagram





Observations and tabulations

Trial No.	Voltage V_R (volts)	Current I_R (mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Break down voltage of the diode = ...

Procedure

1. Make connections as shown in the circuit diagram.
2. Vary the input voltage and note down the ammeter and voltmeter readings and enter it in the tabular column.
3. Plot the reverse characteristics on a graph and calculate the static and dynamic resistance from the graph.

Result

i) The variation of reverse current with reverse voltage has been studied

ii) The break down voltage of the diode = ...V

iii) Static Zener resistance = ...ohm

iv) Dynamic Zener resistance = ...ohm

Experiment No. 2(b)

VOLTAGE REGULATOR USING ZENER DIODE

Aim

To set up and study a Zener diode shunt regulator and to plot the line and lo regulation characteristics and hence to calculate voltage regulation for the followi specifications. Input variation allowed is 7V to 12V. Output voltage and current 5.1V and 20 mA respectively.

Components and equipments required

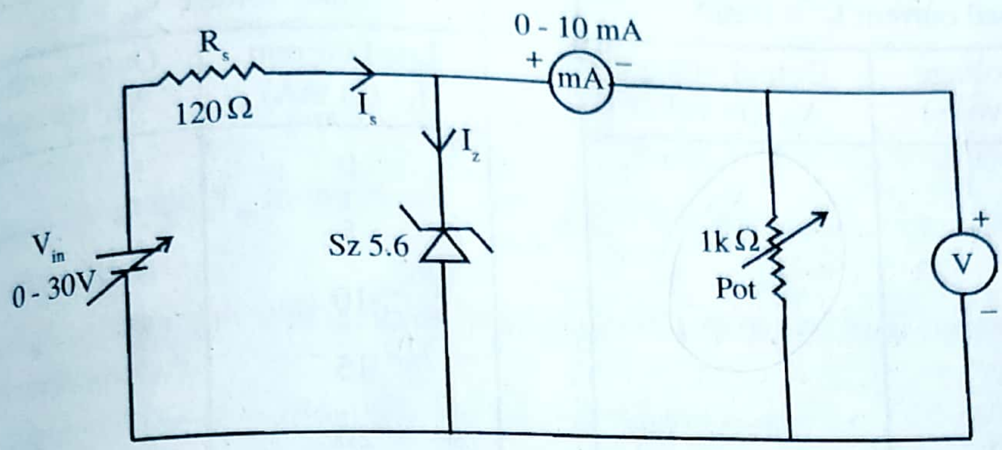
Sl. No.	Component/Equipment	Specification	Quantity
1.	Zener diode	SZ 5.6	1
2.	Resistor	120Ω	1
		1kΩ pot	1
3.	Voltmeter	0 - 15V	1
4.	Ammeter	0 - 100 mA	1
5.	Power supply	DC (0 - 15V)	1
6.	Bread board		1

Theory

When a Zener diode operates in the reverse break down voltage region, the Z voltage V_z remains almost constant irrespective of current through it. A re current flows through it.

A simple voltage regulator using the Zener diode will have a resistanc connected in series with the input voltage and a Zener diode connected in pa with the load. If V_i is the input voltage and V_z is the break down voltage, the series resistor will have a value of $R_S = \frac{V_i - V_z}{I}$ here I represents the series cu and is $I_L + I_z$.

Circuit diagram



Design

We have

$$R_S = \frac{V_i - V_z}{I}$$

R_S must be properly selected to fulfill the following requirements.

(i) When the input voltage is minimum and the load current is maximum, R_S must be small enough to supply current to keep the Zener in break down region and

(ii) When the input voltage is maximum and the load current is minimum R_S should be high to keep the Zener current below the maximum permitted value.

Thus
$$(R_S)_{min} = \frac{(V_{in})_{min} - V_z}{(I_z)_{min} + (I_z)_{max}} = \frac{7 - 5.1}{(2+20)\times 10^{-3}} = 86\Omega$$

$$(R_S)_{max} = \frac{(V_{in})_{max} - V_z}{(I_z)_{max} + (I_z)_{min}} = \frac{12 - 5.1}{(2+10)\times 10^{-3}} = 230\Omega$$

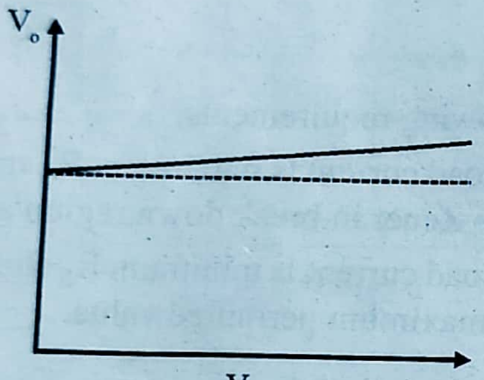
Here we select R_S as $120\,\Omega$.

Observations and tabulations

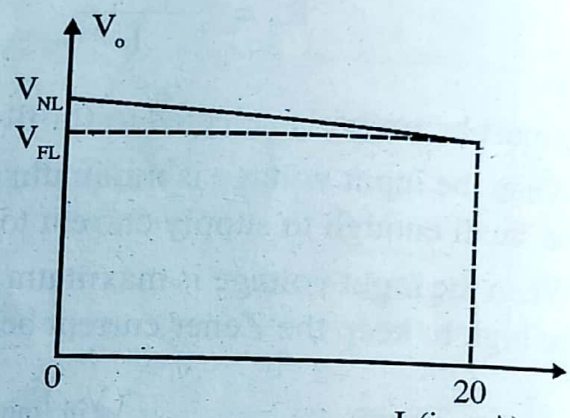
Load current I_L = 10mA	
Input voltage V_i (in volts)	Output voltage V_0 (in volts)
7	
8	
9	
10	
11	
12	

change resistance

Input voltage V_{in} = 12V	
Load current I_L (in mA)	Output voltage V_0 (in volts)
0	
5	
10	
15	
20	



Line regulation



Load regulation

R_L

Procedure

1. Make connections as shown in circuit diagram.
2. Switch on the power supply.

Line regulation

3. Vary the V_{in} in steps of 1 Volt from 7V to 12V and note down the output voltage.
4. Draw the graph V_{in} along X axis and V_o along y axis.

Load regulation

5. Keeping the input voltage constant (say 12V), vary the load resistance ($1k\Omega$ potentiometer).
6. Note down the output voltage for various load current.
7. Draw the graph with I_L along x-axis and V_o along y-axis.
8. Mark V_{NL} (output voltage in the absence of load) and V_{FL} (output voltage at rated current (20mA).

$$\text{Voltage regulation} = \frac{V_{NL} - V_{FL}}{V_{NL}} \times 100$$

Result

i) The line and load characteristics of Zener diode is drawn

ii) Voltage regulation of the regulator = ...%

Note

One may use any Zener diode. Choose suitable value for R_S according to the design procedure. Choose the value of $(I_z)_{max}$ by referring the data sheet of the given diode.

3. HALF -WAVE RECTIFIER WITH AND WITHOUT FILTER

AIM: To examine the input and output waveforms of half wave Rectifier and also Calculate its load regulation and ripple factor.

1. With Filter
2. Without Filter

APPARATUS:

Digital Multimeter	- 1No.
Transformer (6V-0-6V)	- 1No.
Diode, 1N4007	- 1No.
Capacitor 100μf/470 μf	- 1No.
Decade Resistance Box	- 1No.
Breadboard	
CRO and CRO probes	
Connecting wires	

THEORY:

In Half Wave Rectification, When AC supply is applied at the input, only Positive Half Cycle appears across the load whereas, the negative Half Cycle is suppressed. How this can be explained as follows:

During positive half-cycle of the input voltage, the diode D1 is in forward bias and conducts through the load resistor R_L. Hence the current produces an output voltage across the load resistor R_L, which has the same shape as the +ve half cycle of the input voltage.

During the negative half-cycle of the input voltage, the diode is reverse biased and there is no current through the circuit. i.e., the voltage across R_L is zero. The net result is that only the +ve half cycle of the input voltage appears across the load. The average value of the half wave rectified o/p voltage is the value measured on dc voltmeter.

For practical circuits, transformer coupling is usually provided for two reasons.

1. The voltage can be stepped-up or stepped-down, as needed.
2. The ac source is electrically isolated from the rectifier. Thus preventing shock hazards in the secondary circuit.

The efficiency of the Half Wave Rectifier is 40.6%

Theoretical calculations for Ripple factor:

Without Filter:

Vrms = Vm/2

Vm = 2Vrms

Vdc = Vm/Π

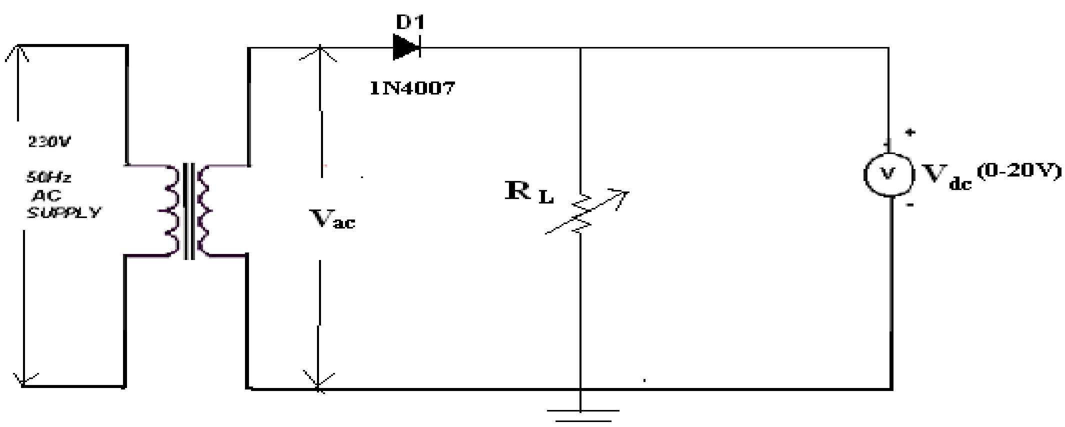
Ripple factor r=$\sqrt{(Vrms/Vdc)^2 - 1}$ =1.21

With Filter:

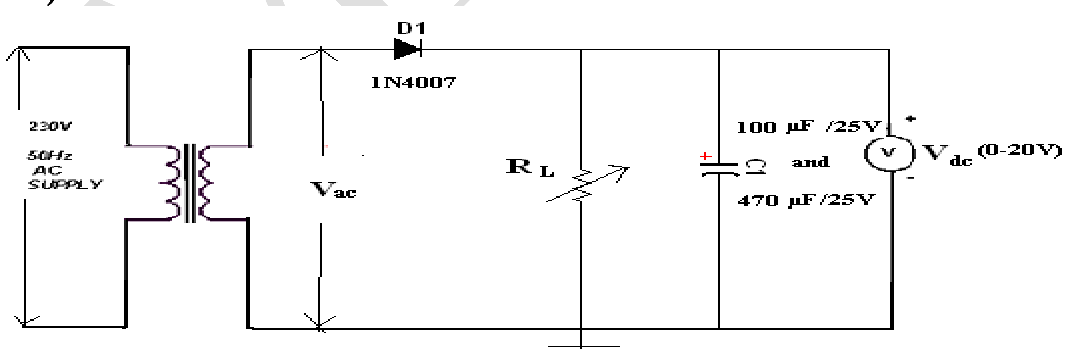
Ripple factor, r = 1/ (2√3 f C R)

CIRCUIT DIAGRAM:

A) Half Wave Rectifier Without Filter:

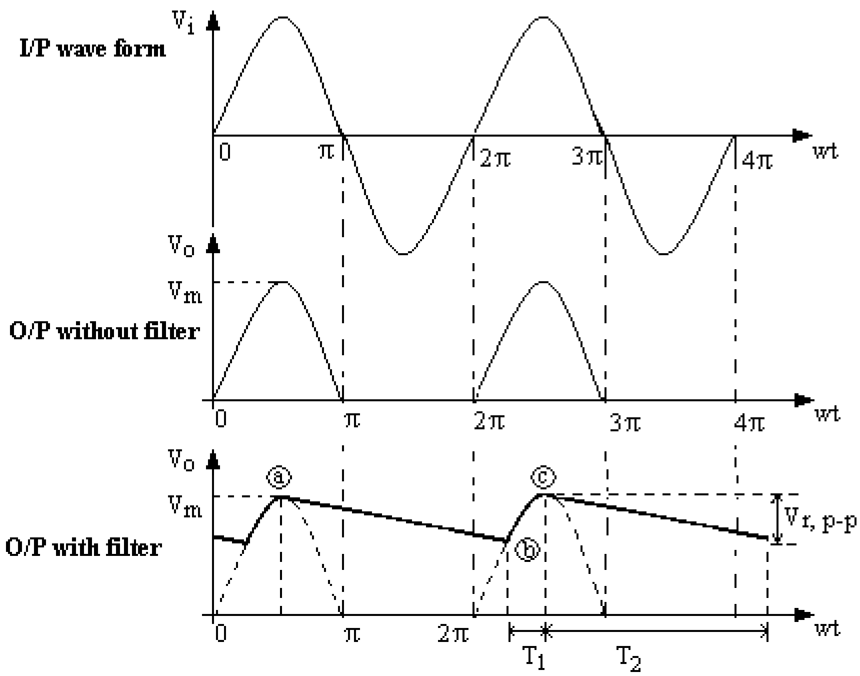


B) Half Wave Rectifier With Filter



MODEL WAVEFORMS:

A WAVEFORMS:



Half-wave Rectifier with capacitor filter wave form

PROCEDURE:

1.Connections are made as per the circuit diagram.
2.Connect the primary side of the transformer to ac mains and the secondary side to the rectifier input.
3.By the multimeter, measure the ac input voltage of the rectifier and, ac and dc voltage at the output of the rectifier.
4.Find the theoretical value of dc voltage by using the formula,

Vdc=Vm/Π

Where, Vm=2Vrms, (Vrms=output ac voltage.)

5.The Ripple factor is calculated by using the formula

r = ac output voltage/dc output voltage.

	Load Resistance	Capacitance	Output voltage		Ripple factor
			V_{dc}	V_{ac}	V_{ac} / V_{dc}
Without filter	R_L	0			
With filter		1. 2. 3. 4.			

	Capacitance	Load resistance	Output voltage		Ripple factor
			V_{dc}	V_{ac}	V_{ac} / V_{dc}
With filter	C=	1. 2. 3. 4. . . .			
With filter	C=	1. 2. 3. 4.			
With filter	C=	1. 2. 3. 4.			

EXPERIMENT 05: FULL WAVE CENTER TAP RECTIFIER WITH C FILTER

AIM: To examine the input and output waveforms of Full Wave Center Tap Rectifier and also calculate its ripple factor.

1. Without Filter
2. With Capacitor Filter

APPARATUS: Digital Multimeter, Center tap Transformer (9V-0-9V), Diode 1N4007 ,Capacitor 100 µf , Resistors, Breadboard, CRO and CRO probes and connecting wires.

THEORY:
The circuit of a center-tapped full wave rectifier uses two diodes D1 and D2. During positive half cycle of secondary voltage (input voltage), the diode D1 is forward biased and D2 is reverse biased. So the diode D1 conducts and current flows through load resistor R_L.

During negative half cycle, diode D2 becomes forward biased and D1 reverse biased. Now, D2 conducts and current flows through the load resistor R_L in the same direction. There is a continuous current flow through the load resistor R_L, during both the half cycles and will get unidirectional current as show in the model graph. The difference between full wave and half wave rectification is that a full wave rectifier allows unidirectional (one way) current to the load during the entire 360 degrees of the input signal and half-wave rectifier allows this only during one half cycle (180 degree).

THEORITICAL CALCULATIONS:

Without Filter:

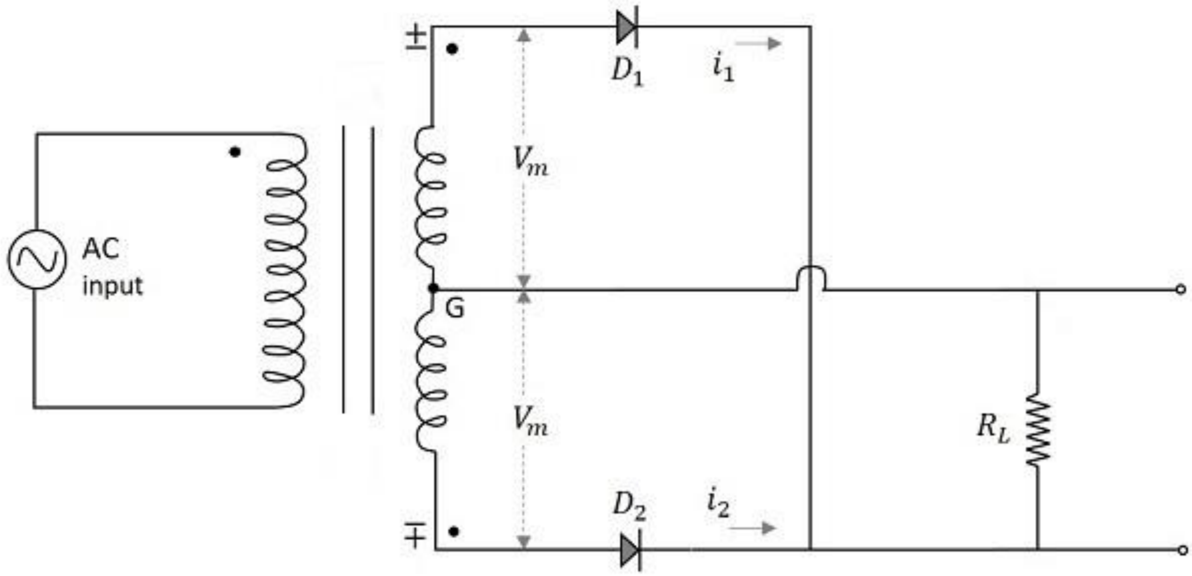
$$V_{rms}=V_m/\sqrt{2}$$
$$V_m=\sqrt{2}V_{rms}$$
$$V_{dc}=2V_m/\pi$$

Ripple factor $r = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}=0.48$

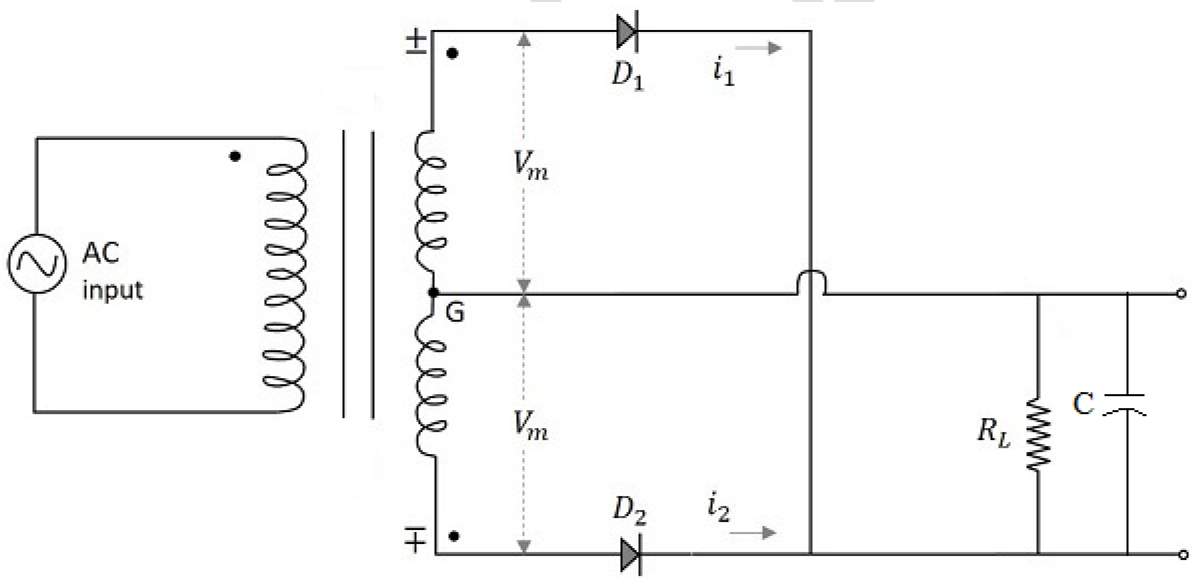
With Filter:

$$\text{Ripple factor, } r = \frac{1}{4\sqrt{3}f\cdot C\cdot R}$$

CIRCUIT DIAGRAM:



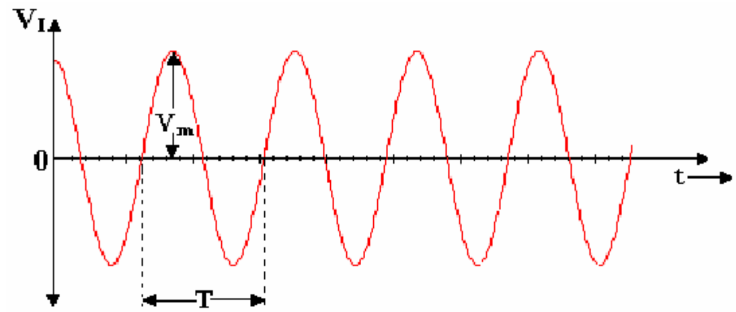
Circuit diagram of a center-tapped full wave rectifier



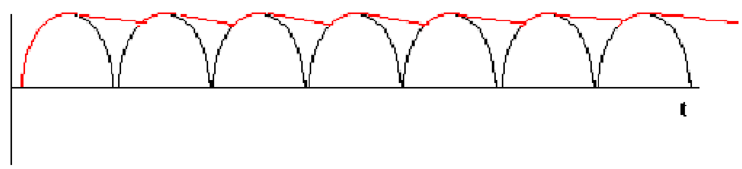
Circuit diagram of a center-tapped full wave rectifier with C filter

EXPECTED WAVEFORMS: (only for reference)

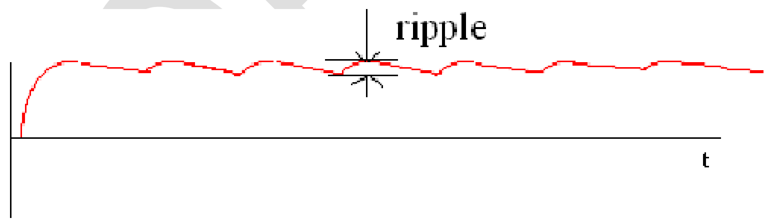
A) INPUT WAVEFORM



B) OUTPUT WAVEFORMS WITH FILTER:



C) OUTPUT RIPPLES



PROCEDURE:

Without filter:

1. Connect the circuit as per the circuit diagram
2. Connect CRO across the load R_L
3. Note down the peak value V_m of the signal observed on the CRO
4. Switch the CRO into DC mode and observe the waveform. Note down the DC shift
5. Calculate V_{rms} and V_{dc} values by using the formulae

$$V_{rms} = \frac{V_m}{\sqrt{2}}, \quad I_{rms} = \frac{I_m}{\sqrt{2}}, \quad V_{dc\ or\ Avg.} = \frac{2V_m}{\pi}, \quad I_{dc\ or\ Avg.} = \frac{2I_m}{\pi}$$

6. Calculate the ripple factor by using the formulae

$$Ripple\ factor = \frac{Vac}{Vdc} = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$$

With filter:

1. Connect the capacitor filter across the load in the above circuit diagram
2. Proceed with the same procedure mentioned above to measure V_{ac} value from the CRO and also dc shift from CRO.
3. Calculate V_{ac} & V_{dc} by using the formulas

$$Ripple\ factor = \frac{Vac}{Vdc} = \frac{1}{4\sqrt{3}f \cdot C \cdot R}$$

where V_{ac} is the peak to peak amplitude of filter output

4. Calculate ripple factor

OBSERVATIONS:

WITHOUT FILTER:

R_L (KΩ)	V_{ac} (Volts)	V_{dc} (Volts)	$Ripple\ factor = \frac{V_{ac}}{V_{dc}}$

	Load Resistance	Capacitance	Output voltage		Ripple factor
			V_{dc}	V_{ac}	V_{ac} / V_{dc}
Without filter	R_L	0			
With filter		1. 2. 3. 4.			

	Capacitance	Load resistance	Output voltage		Ripple factor
			V_{dc}	V_{ac}	V_{ac} / V_{dc}
With filter	C=	1. 2. 3. 4. . . .			
With filter	C=	1. 2. 3. 4.			
With filter	C=	1. 2. 3. 4.			

BRIDGE RECTIFIER

Aim:

To construct full wave bridge rectifier and measure ripple factor with and without filter

Theory

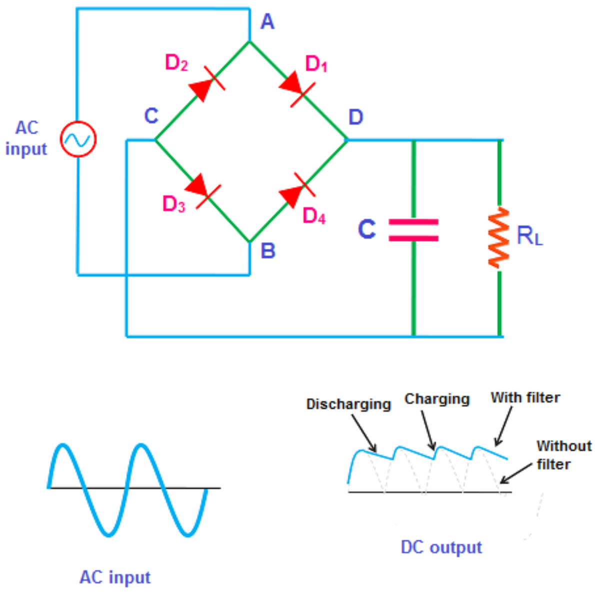


Fig: Bridge rectifier with filter

(Theory, equations and tabular column as in the case of full wave rectifier)

Experiment No. 14

VOLTAGE MULTIPLIER

Aim

To construct a voltage doubler and tripler and to verify the voltages.

Components and equipments required

Sl.No	Component/Equipment	Specification	Quantity
1	Diode	IN 4001	3
2	Capacitor	100μF	3
3	Resistor	47kΩ	1
4	Multimeter		
5	Power supply		
6	Bread board		

Theory

A voltage multiplier is a circuit which produces a dc output voltage equal to multiples of the peak input voltage, that is, $2V_m$, $3V_m$ and so on. Voltage multiplier are used in high voltage with low current devices like cathode ray tubes. There are different types of multipliers available like voltage doubler, voltage tripler and so on.

Voltage doubler

The circuit diagram of a voltage doubler is shown in figure 1. During the positive half cycle of the input voltage D_1 conducts (and D_2 does not conduct) and capacitor C_1 charges towards the peak secondary voltage V_m. During the negative half cycle D_2 conducts (and D_1 doesnot conduct) and capacitor C_2 charges to sum of peak value of secondary voltage and voltage across C_1. Thus the output voltage at load V_L becomes

$$V_L = 2V_m$$

Voltage tripler

The voltage doubler circuit can be extended to obtain any multiple of the peak input voltage (V_m) like $3V_m$, $4V_m$ and so on.

Observations and tabulations

Doubler

V_{rms} (volts)	V_m (volts) $\sqrt{2} \cdot V_{rms}$	Output	
		Theoretical $2V_m$	Practical

Tripler

V_{rms} (volts)	V_m (volts) $\sqrt{2} \cdot V_{rms}$	Output	
		Theoretical $3V_m$	Practical

Circuit diagram

Voltage doubler

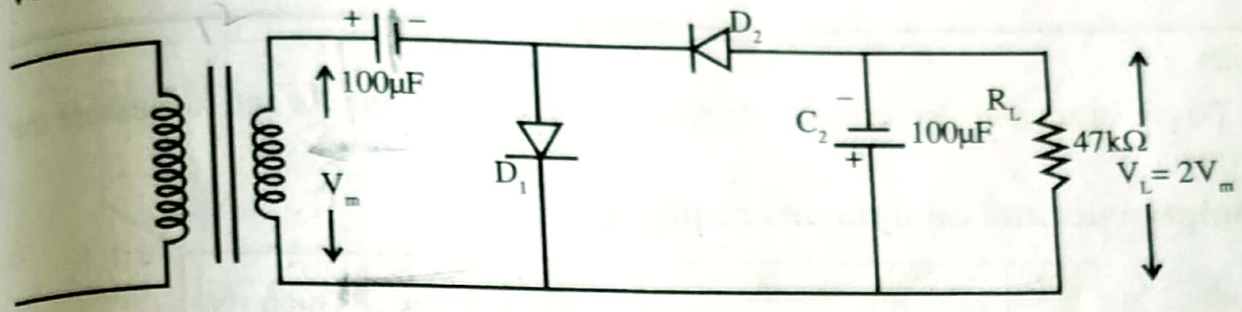


Fig : (1)

Voltage tripler

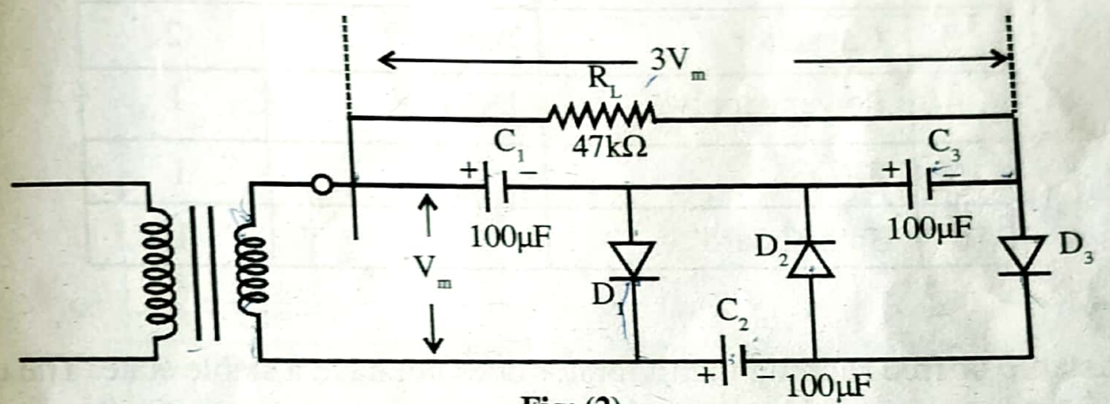


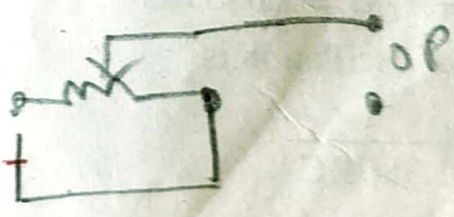
Fig: (2)

Procedure

1. Make connections an shown in circuit diagrm.
2. Apply the input voltage.
3. Note down the ac input voltage and dc output voltage using multimeter

Results

A voltage doubler and a tripler are constructed and measured the outputs.



Experiment No. 12

LCR CIRCUITS

Aim

To obtain the resonant frequency of a RLC series circuit.

Components and equipments required

Sl. No.	Component/ Equipment	Specification	Quantity
1	Resistors	100 Ω	1 No
2	Capacitor	0.22 μF	1 No
3	Inductor	1 mH	1 No
4	Multimeter		
5	Function generator		
6	CRO		

Theory

An ac circuit is said to be in resonance when the natural frequency of the circuit (LCR) coincides with that of the applied voltage. At this stage the applied voltage V and the resulting current I are in same phase. This happens only in pure resistive circuits. Here LCR circuit behaves like pure resistive circuit. This happens because the phase angle produced by the inductance cancelled by the phase angle produced by the capacitance. This occurs when $X_L = X_C$.

The impedance of the circuit is,

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

when $X_L = X_C$ Then,

$$Z = R$$

Condition for resonance

We have, $X_L = X_C$

$$L\omega = \frac{1}{\omega C}$$

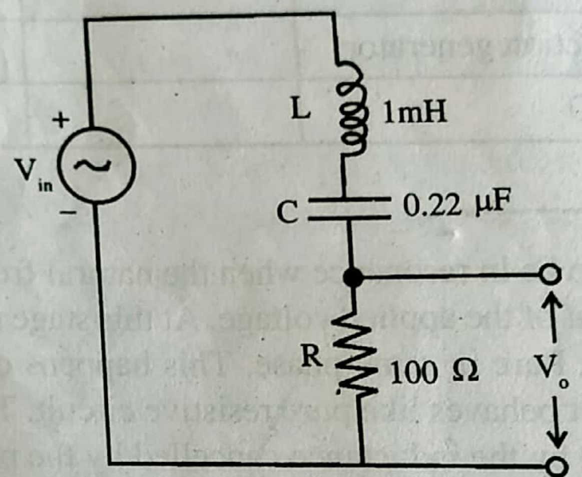
$$\omega^2 = \frac{1}{LC}$$

or
$$\omega = \frac{1}{\sqrt{LC}}$$

but $\omega = 2\pi f_o$ Then,

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$ where f_o is the resonant frequency.

Circuit diagram



Design

$$f_0 = \frac{1}{2\pi\sqrt{LC}}$$

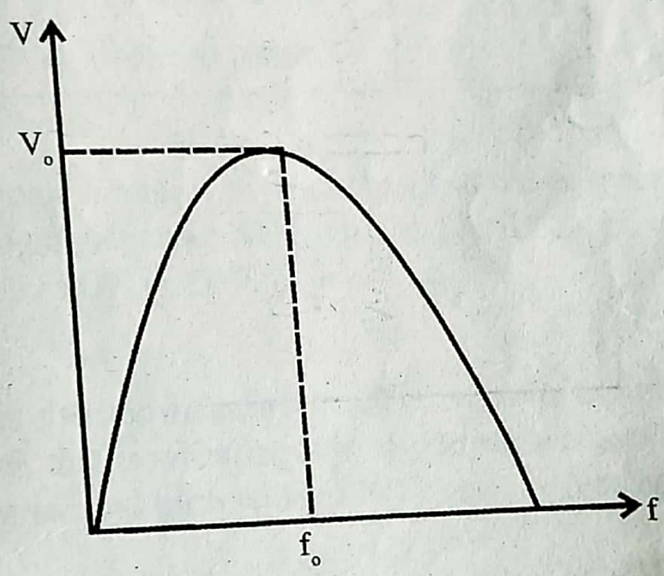
Let $L = 1mH$, $C = 0.22\mu F$, $R = 100\Omega$

$$f_0 = \frac{1}{2\pi\sqrt{1\times10^{-3}\times0.22\times10^{-6}}}$$

$$= 10730 \text{ Hz}$$

Observation

Frequency (f) (Hz)	V_0 Output voltage (volt)



rocedure

Connections are made as shown in circuit diagram.

Switch ON the function generator, and adjust its output voltage to about 10V (p-p)

. Vary the frequency of function generator from zero hertz (Hz) to MHz and for different value of f, note down the output voltage.

. Draw the graph of frequency versus voltage.

. From the graph, find out the frequency at which voltage V_0 is maximum.

Result

Designed resonant frequency = ... Hz

Observed resonant frequency = ... Hz