List of Experiments:

1. Study of Cathode Ray Oscilloscope (CRO) and Function generator.
2. To plot the V-I characteristic of p-n junction diode.
3. To plot the V-I characteristic of a Zener Diode
4. To study the half wave, full wave and bridge rectifier for 1 $K\Omega$ load with and without capacitor of 100 μF and 1000 μF .
5. To plot the V-I output characteristic of common emitter pnp transistor configuration.
6. To study the characteristic curve of n-channel JFET.

Experiment No: 1

Aim: Study of Cathode Ray Oscilloscope (CRO) and Function generator.

Apparatus required:

1. CRO
2. Function Generator
3. Connecting cables

Theory:

Cathode ray Oscilloscope:

CRO is a useful and versatile laboratory instrument used for display, measurement, and analysis of waveforms and other phenomenon in electrical and electronics circuits. CRO's are fast X-Y plotters, displaying an input signal versus another signal or versus time. The stylus of this plotter is a luminous spot which moves over the display area in response to an input voltage. The luminous spot is produced by a beam of electrons striking on fluorescent screen. CRO's operate on voltages however it is possible to convert current, strain, acceleration, pressure, and other physical quantities into voltages with the help of transducers and thus present visual representation of a wide variety of dynamic phenomenon on CROs.

A CRO consists of cathode ray tube and additional circuitry

1. Electron Gun Assembly
2. Deflection plate assembly
3. Fluorescent screen
4. Glass Envelope
5. Base

Basic CRO circuit:

1. Vertical(Y) Deflection System: The signal to be examined is usually applied to the vertical or Y deflection plates through an input attenuator and a number of amplifier stages. Vertical amplifier is required because the signals are not strong enough to produce measurable deflection on the CRT screen.
2. Horizontal deflection System: The plates are mounted vertically and produce a horizontal deflection. This pair of plates is fed by sweep voltage that produces a time base.

Function Generator:

A function generator is a versatile instrument that delivers a choice of different waveforms of frequencies adjustable over a wide range. The most common output waveforms are sine, triangular, square and saw tooth waves. The capability of the function generator to phase lock to external signal source is another useful feature. One function generator may be used to phase lock a second function generator and the two outputs can be displayed in phase by an adjustable amount.

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Experiment No:2

Aim: To plot the V-I characteristic of p-n junction diode.

Apparatus required:

1. Voltmeter (0-10 V)
2. Ammeter (0-50mA)
3. Resistance Box
4. p-n junction diode

Theory:

The total current in a p-n junction diode is the sum holes and the minority carrier electrons. The current I is related to the applied voltage V by the equation,

$$I = I_o(e^{V/V_T} - 1),$$

where I_0 is the reverse saturation current and V_T is the volt equivalent of temperature

Circuit Diagram:

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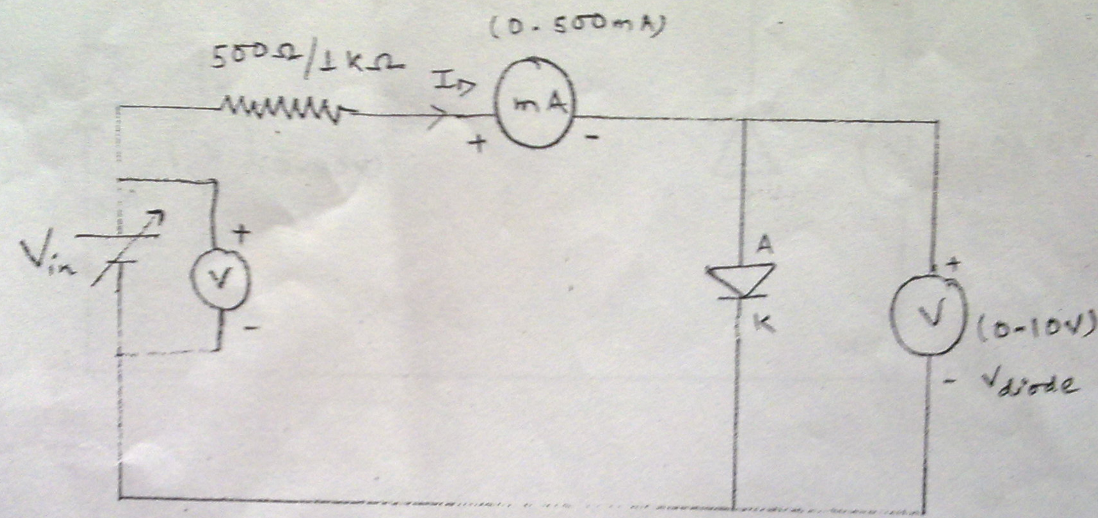


Observation Table:

S.No	V_{diode}	I_D

Results and Discussion:

Experiment No: 3

Aim: To plot the V-I characteristic of a Zener Diode.

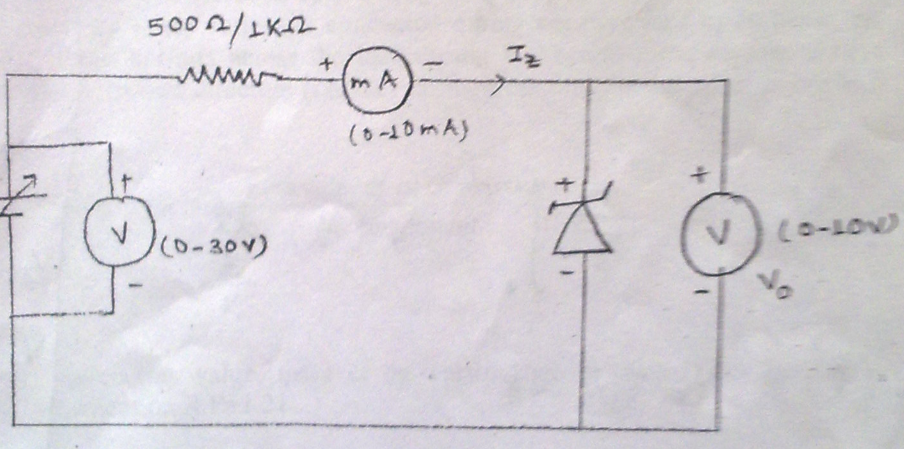
Apparatus Required:

1. Power supply (0-30 volts)
2. Resistance Box
3. Ammeter
4. Voltmeter
5. Zener diode

Theory:

Zener diode is specially designed to operate in the revere biased condition. In the reverse biased condition the diode breaks down beyond a particular voltage known as breakdown voltage and it offers a constant voltage thereafter for a large variation in current.

Circuit Diagram:



Observation Table:

S.No	Input Voltage V_{in}	Diode Current I_z	Output voltage V_o

Results and Discussions:

SF of filter circuit

$R.F. = \frac{\text{rms value of ... of wave}}{\text{average value of wave}}$

$R.F = \frac{\text{A.C. voltage at O/P}}{\text{D.C. voltage at O/P}}$

V_{in}

$R.F. = \frac{I_{rms} V_{rms}}{I_{dc} V_{dc}}$

$$R.F. = \sqrt{\left(\frac{V_{rms}}{V_{dc}}\right)^2 - 1}$$

$$V_{rms} = \sqrt{\frac{1}{T}\int_0^T v(t)^2\, dt}$$

$$V_{dc} = \frac{1}{T}\int_0^T v(t)\, dt$$

$v(t) = V_m \sin \omega t$

HW ⇒ $v(t) = V_m \sin \omega t$ if $0 \leq t \leq T/2$

$v(t) = 0$ otherwise

F.W ⇒ $v(t) = \frac{V_m}{2} |\sin \omega t|$ for all t

Bride ⇒ $v(t) = V_m |\sin \omega t|$ for all t

HW ⇒

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

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

$r_{HW} = \sqrt{\frac{\pi^2}{4} - 1}$

$= 1.21$

FW

$V_{dc} = \frac{2V_m}{\pi}$

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

0.48

Experiment No

Aim: To s... without...

Experiment No:4

Aim: To study the half wave, full wave and bridge rectifier for 1 $K\Omega$ load with and without capacitor of 100 μF and 1000 μF.

Apparatus required:

1. AC power supply
2. transformer
3. resistance box
4. capacitor
5. CRO
6. diode

Theory:

1. **Half-Wave Rectifier:**

This rectifier conducts current only during the positive half cycle of input ac supply; no current is conducted during negative half cycle hence no voltage appears across the load during it. Therefore the current always flows in one direction (i.e. d.c) through the load though after every half cycle.

$$V_{in} \text{ripple factor} = \frac{r.m.s\ value\ of\ ac\ component}{dc\ component}$$

$$= \frac{V_{ac}}{V_{dc}}$$

smaller this value, more is the rectification produced. For half wave rectification R.F=1.21

2. **Full-Wave Rectifier**

In full-wav rectifier the current flows through the load in the same direction for both half-cycles of input ac voltage. Two circuits used for this are:

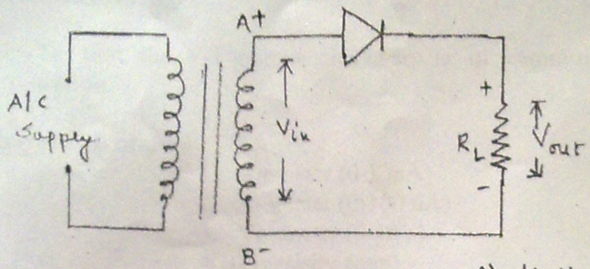
a. Centre-Tap Full Wave Rectifier

Ripple factor==0.48

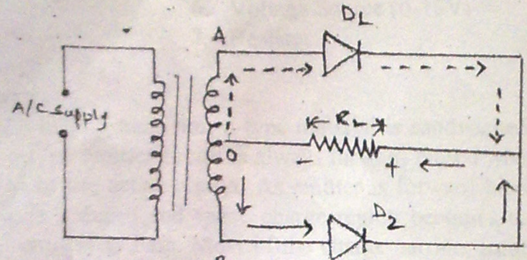
b. Full-Wave Bridge Rectifier

Ripple Factor==0.48

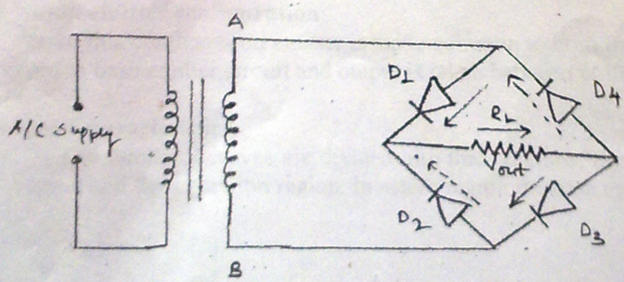
Circuit Diagram:



a) Half Wave Rectifier



b) Centre-tap full-wave Rectifier



c) Full-Wave Bridge Rectifier

Observation Table:

S.No	Rectification	Amp/div of CRO	No of division in CRO	V_{dc}	V_{ac}	Ripple Factor
1	Half Wave					
2	Full Wave					

Results and Discussion:

Experiment No: 5

Aim: To plot the V-I output characteristic of common emitter pnp transistor configuration.

Apparatus Required:

1. Ammeter (0-1 mA)
2. Ammeter (0-100 uA)
3. Voltmeter (0-10V)
4. Transistor (pnp)
5. Voltage Source (0-30V)
6. Voltage Source (0-15V)
7. Resistor

Theory:

In pnp transistor, n-type material is sandwiched between two p-type material. The p-type emitter circuit is always forward biased whereas collector circuit is reverse biased in the active region. As emitter is forward biased. barrier potential at emitter diode is reduced and space charge region becomes narrower, current starts to flow from emitter to base. Most of the charge carriers from emitter reach the collector to constitute the collector current I_C.

Common emitter configuration:

In this configuration emitter is made common to both base and collector. Input is given at base-emitter circuit and output is taken between collector-emitter circuit.

Output Characteristics:

The family of curves are divided into three regions, the active region, the cut-off region and the saturation region. In active region the base current is given as

$$I_B = -(I_C + I_E)$$

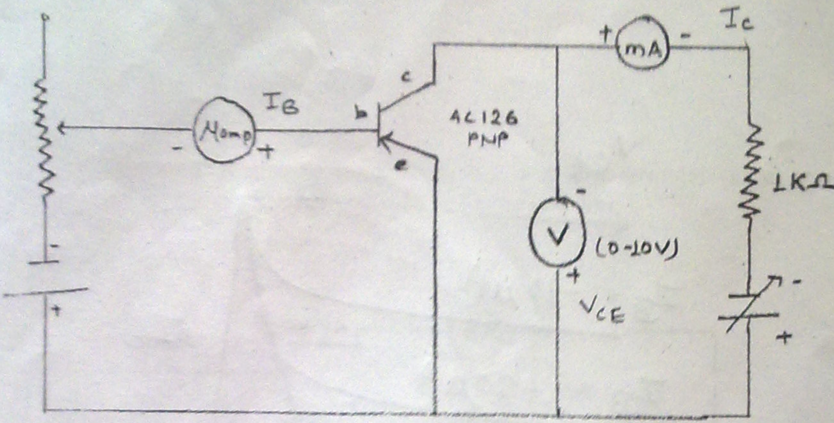
$$I_C = \frac{I_{CO}}{1-\alpha} + \frac{\alpha I_B}{1-\alpha}$$

I_C is collector current where I_{CO} is leakage current due to minority current, β is current amplification factor.

$$\beta = \left(\frac{\Delta I_C}{\Delta I_B}\right)_{VCE}$$

$$\beta = \frac{\alpha}{1-\alpha}$$

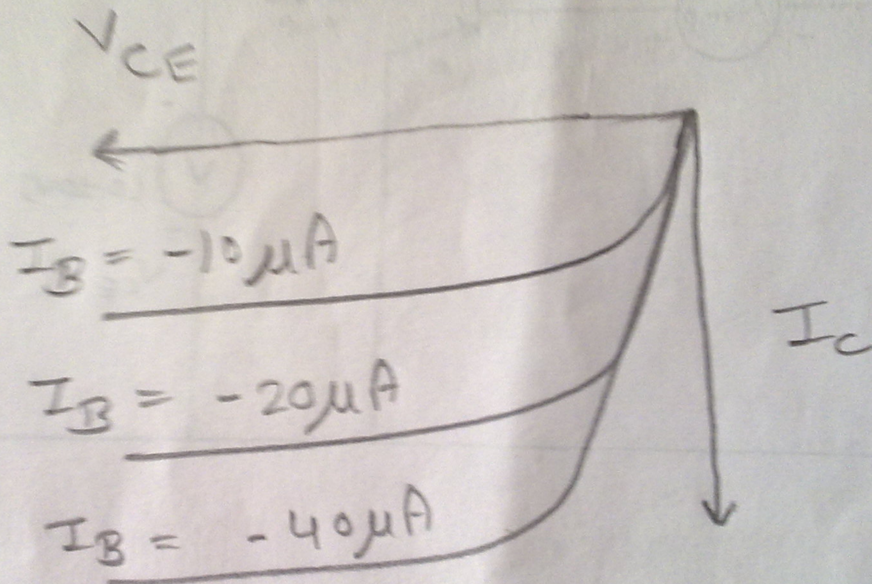
Circuit Diagram:



Observation table:

S. No	$I_B =$		$I_B =$		$I_B =$	
	V_{CE}	I_C	V_{CE}	I_C	V_{CE}	I_C

Results and Discussion:


VCE
IB = -10μA
IB = -20μA
IB = -40μA
IC

Experiment No:6

Aim: To study the characteristic curve of n-channel JFET

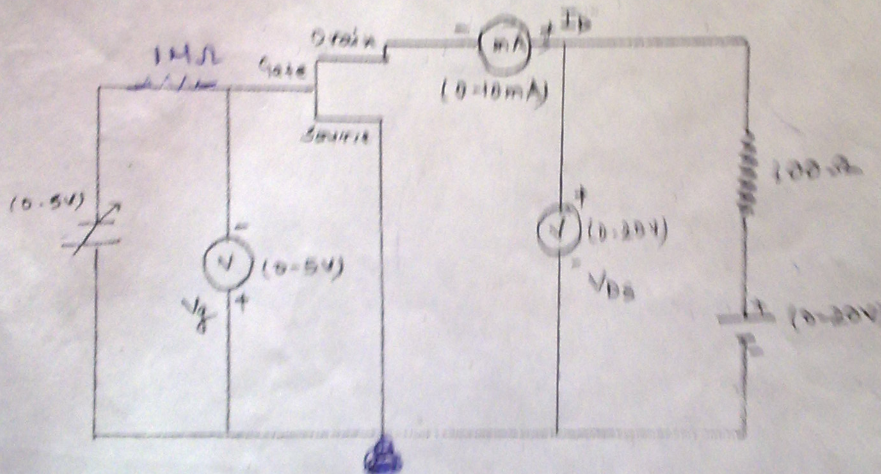
Apparatus Required:

1. n-channel JFET
2. milliammeter
3. Voltmeter
4. d.c power supply

Theory:

The JFET is a three terminal device with one terminal (gate) capable of controlling the current between other two (source and drain).

Circuit Diagram:



Observation Table:

S.no	Drain-source voltage V_{DS}	Drain Current I_D				
		V_g = 0 V	V_g = 0.5 V	V_g = 1 V	V_g = 1.5 V	V_g = 2 V
1						
[illegible]						
3						
4						

Results and discussion:

n-channel JFET