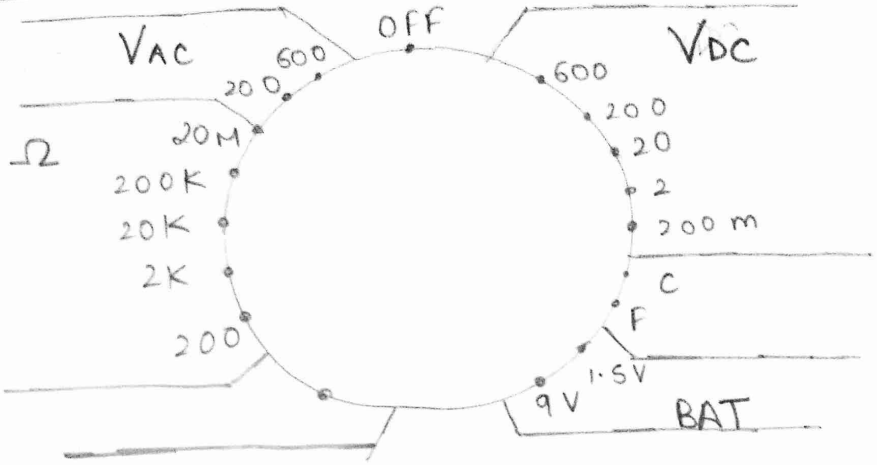
DELTA | INDEX

S.No	Experiment Description	Page No.	Experiment Date	Submission Date	Remarks
1)	Study of lab equipments & components CRO, multimeter, function generator, power supply, active and passive components and breadboard.	1 2 3 4 5 6 7	9/09/24		(A) 23/09 (A)
2)	P-N Junction diode charactri --- from graph.	8, 9 10, 11 12, 13	16/09/24		(A) 23/09 (A)

Sep 23, 2024, 20:52



Various Symbols and their Description

Symbols	Measurement Function	Description
V~	AC Voltage	Measures amount of AC Electrical pressure
V⎓	DC Voltage	Measures amount of DC Electrical pressure
mV	Mille Volts	(1/1000 V)
A	Amperes	Measures amount of current flow
mA	Mille Amperes	(1/1000 A)
Ω	Ohms	Measurement of resistance of the flow of current
▶|	Diode	To check polarity and serviciability of diode.
)))))	Audible Continuity	Audible indication of continuity for low reals.
|←	Capacitance	To measure the capacitance value (Generally low)

Sep 23, 2024, 20:52

Experiment :

Date 09/09/24
Page No. 1

Experiment -01

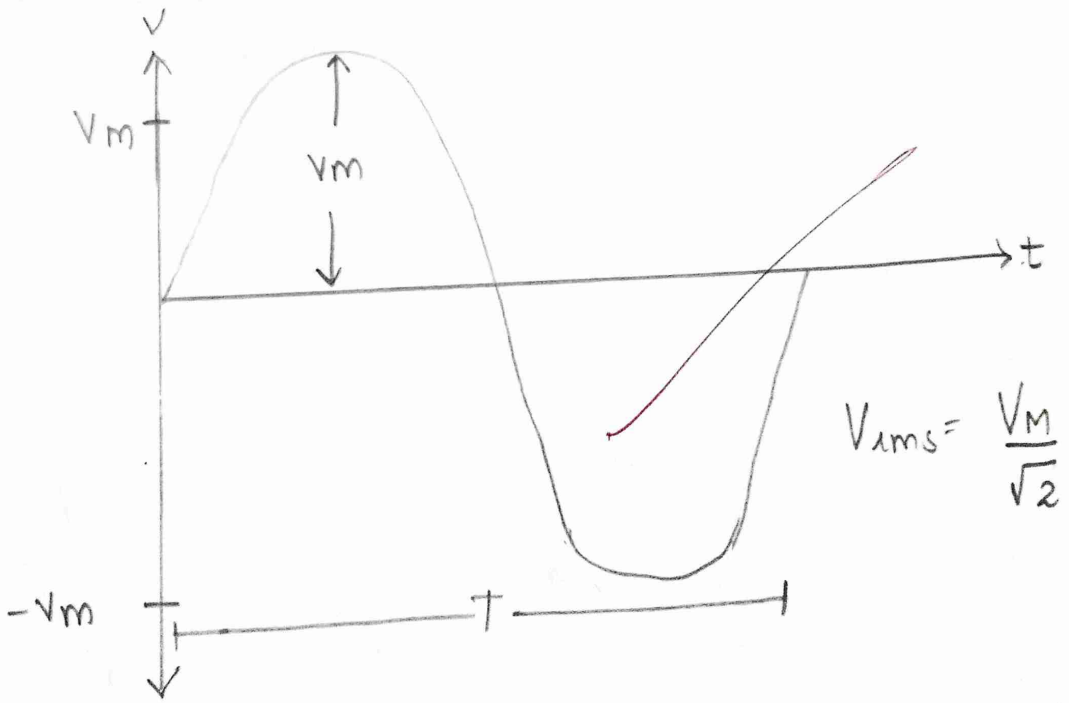
- Aim :- Study of lab equipments & components- CRO, multimeter, function generator, power supply, active & passive components & breadboard.
- Apparatus required :- Digital multimeter, resistor, capacitor, inductor, CRO, function generator.
- Theory :-

① Digital multimeter :- A meter is a measuring instrument. An ammeter measure current, a voltmeter measures the potential difference (voltage) b/w two points and an ohm meter measure resistance. A multimeter combines these functions and possibly some additional ones as well, into a single instrument. Digital meters given an output in numbers, usually on a liquid crystal display.

② CRO :- The Cathode-ray oscilloscope (CRO) is a common laboratory instruments that provides accurate time and amplitude measurements of voltage signals over a wide range of frequentes. Its reliability, stability & ease of operation makes it sustable as a general purpose laboratory instruments.

DELTA

Sep 23, 2024, 20:53



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

Experiment :

Date

Page No. 2

- Measurements using CRO :-

1. Time period :- The time taken by an alternating voltage to complete one cycle is called its time period.
   - Measure the number of divisions for a single cycle on time axis.
   - Multiply it by the value indicated by the times per divisions, knob on CRO.
   - This gives the time period of the alternating voltage.

2. Frequency :- The number of cycles completed in one second is called the frequency of the alternating voltage. Its unit is Hertz. Frequently is given by the reciprocal of time period T.

   i.e. $f = \frac{1}{T}$

   - measure the time period (T)
   - calculate $f = \frac{1}{T}$

3. Peak to Peak value :- The maximum value +ve or -ve of the alternating quantity is known as its peak value. It is also called maximum value or amplitude of alternating quantity.
   The total voltage measured from -ve peak to +ve peak is called the peak to peak voltage.
   - Measure the number of divisions on the voltage axis.
   - Multiply it by the value indicated by the volts/dv.

DELTA

Sep 23, 2024, 20:53

Colour	Digit		Multiplier	Tolerance (%)
	I	II	III	IV
Black	0	0	10^0 (1)	
Brown	1	1	10^1	1
Red	2	2	10^2	2
Orange	3	3	10^3	
Yellow	4	4	10^4	
Green	5	5	10^5	0.5
Blue	6	6	10^6	0.25
Violet	7	7	10^7	0.1
Grey	8	8	10^8	
White	9	9	10^9	
Gold			10^{-1}	± 5
Silver			10^{-3}	± 10
None				± 20

Colour coding for resistors

•) EXT :- Allows external trigering signals to be fed from the socket marked TRIG. INP.

• LINE :- Displayed signal synchronted with main lines frequency.

③ Function Prenerator :- The caddo 4061 - 10MHz function - Pulse generator - 40 MHz frequency counter is a micro controller based versatile instruments having frequency modulation facility. Any type of output waveforms can be modulated with the external output signal. A variable frequency control facilitates accurate frequency measurment The distoration is kept within 1.8 % typically for majority of the frequency ranges. Frequencies are displayed in a bright backit. LCD display controlled by microcontroller.

④ Passive components :-

1) Resistor :- A resistor is a passive two-terminal electrical components that implements electrical resistance as a circuit element. The current through a resistar is in direct proportional to the voltage across the resistar's terminal. Thus, the ratio of the voltage applied across a resistor's terminals to the intensity of current through the circuit is called resistance. This is represented by ohm's law.

$$I = V/R$$

2) Inductor :- An inductor is a passive components that is used in most power electronic circuit to store energy in the form of magnetic energy when electricity is applied to it. One of the key properties of an inductor is that it impedes or opposes any change in the amount of current flowing through it whenever the current across the inductor changes, it either acquires charge or the loses the charge in order to equalize the current passing through it.

3) Capacitor :- A capacitor is a two-terminal electrical device that can store energy in the form of an electric charge. It consists of two electrical conductors that are separated by a distance. The space blw the conductors may be filled by vaccuum or with an insulating material known as a dielectric.

(5) Function Generator :-

Features :-

- fully microcontroller based function generator.
- Square, Triangle, Ramp, Pulse & TTL outputs.
- 1 Hz to 10 MHz frequency range.
- 20 Vpp signal output.
- Frequency modulation
- LCD controlled individual keys.
- Rise & fall time 5 ons.

DELTA®

- Low distortion
- 20 & 40 dB fixed & 20dB variable alternation
- Compact & light weight

Frequency Range : DC to 10 MHz
Resolution : 1 Hz
Sensitivity : 0.5 Volts
Frequency Accuracy : ± 0.5%
Frequency Display : LCD controlled indivitual keys.
Input Impedance : 1M
Maximum Input Voltage : 200V (DC + AC (PEAK))
Power consumption : 230V AC ± 10%, 50Hz
operating conditions : 12 VA (approx.)
Dimension (mm) : W196, H80, D62
weight : 3 kgs (approx.)

★ Technical Specifications :-

operation mode : Sine, Square, Triangle, Ramp, Pulse, TTL
Frequency Ranges : 1 Hz - 10MHz in 7 steps (for sine waves)
1 Hz - 3MHz (for other wave forms)
Frequency Accuracy :- ± 0.5%.
Sine wave Distortions : 1.8% typical
Square wave / Pulse rise : < 50ns & fall time
Pulse Duty cycle : 15% - 85% variation (minimum width 200ns)

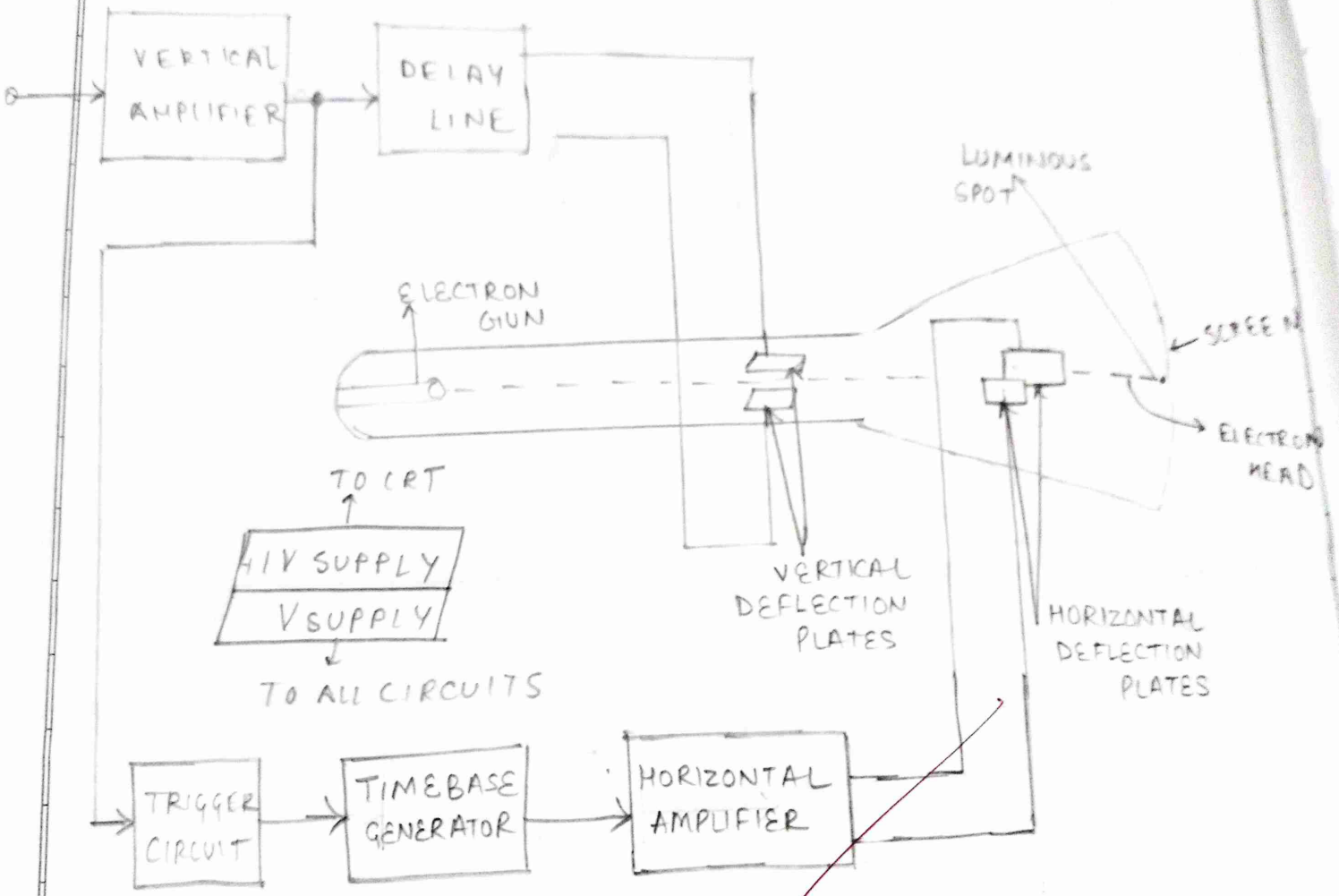


Fig. 3 : BLOCK DIAGRAM OF A TYPICAL OSCILLOSCOPE

Experiment :

Date

Page No. 6

Knob on the CRO

- This gives the peak value

* CRO Front Panel controls :-

- Power and Scale Illuminate :- Turns instrument on and controls illumination of the gratitude.
- Focus :- Focuses the spot or trace on the screen (control the sharpness of the trace).
- Intensity :- Regulates the brightness of the spot on trace.
- X 10 :- Gives 10 times magnification of X-signal.
- XY :- Cuts of the time base (use of X-Y display)
- CH1 / CH2, TRIG1 / TRIG2 :- Switch selects channel & trigger source (out CH1 & pressed CH2).
- MONO / DUAL :- Select mono or dual trace operation.
- ALT / CHOP / ADD :- Select alternate or chopped in dual mode. If mono selected then enables addition as subtraction of channel. i.e. CH1 ± CH2.

DELTA®

Sep 23, 2024, 20:54

Experiment :

Date

Page No. 7

Triangular Non-linearity : < 1%
Display : LCD controlled individual keys
Output Impedance : 50Ω
output voltage : 20vp (open circuited)
Attenuation : 20dB & 40 dB (fixed)
: 20 dB (Variable) Total 80 dB
Level flatness : 0.5 dB (1Hz to 3MHz)
: 1.5 dB 40 MHz Typically
DC offset : ± 5v (approximately) adjustable

Modulation : frequency modulation
Modulation frequency : DC to 20KHz
Range modulation input : 2 Vpp (max.)
frequency counters : 40 MHz

Anderprastha Engineering College, GZB. (0030)		
Viva - Voce Information		
Date	Grade	Faculty Signature
23/09	A	

Experiment :

Date 16/09/24
Page No. 8

Experiment-2

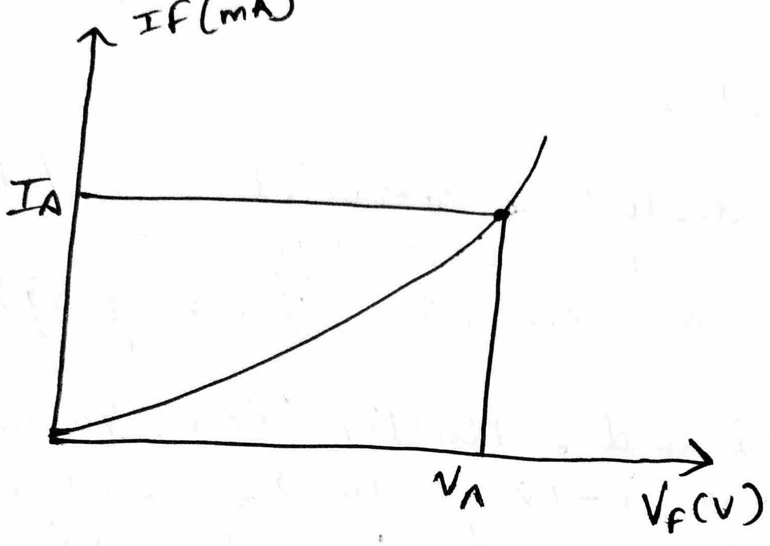
Aim: P-N junction diode : Characteristics of P-N junction diode - static and dynamic resistance measurement from graph.

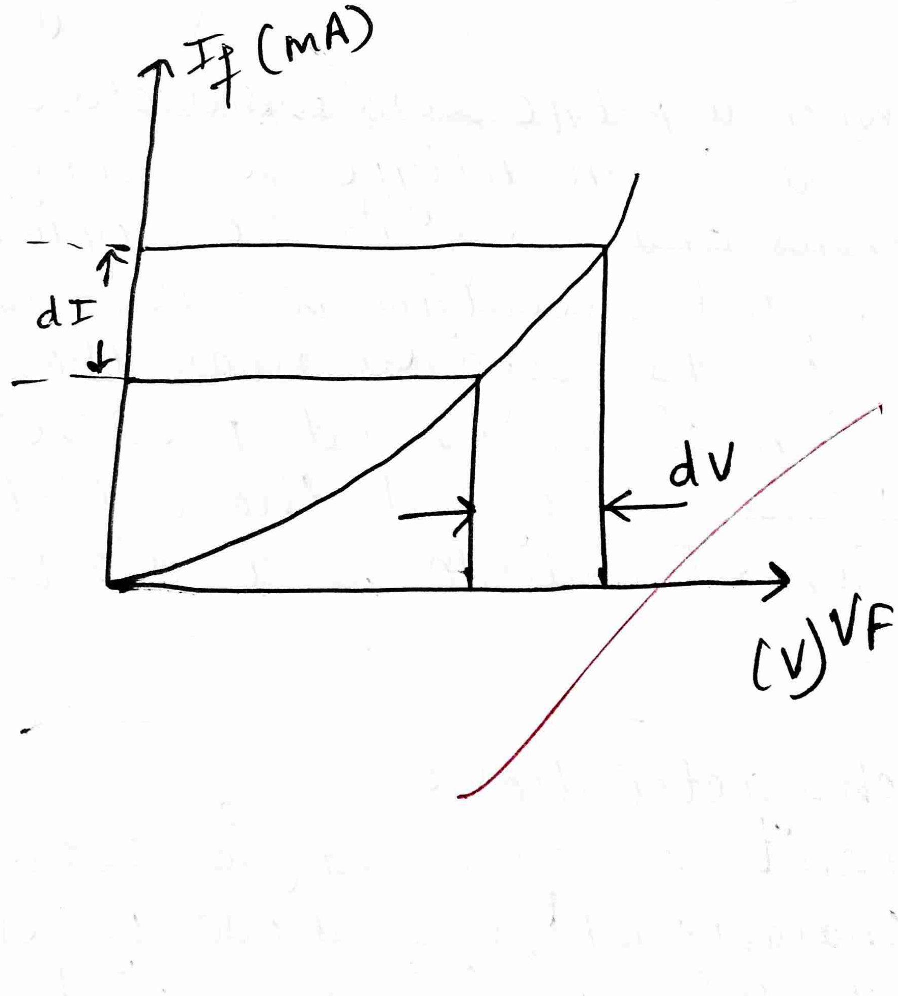
Apparatus: Breadboard, Multimeter, Variable DC power supply (0-1V, 0-10V), Resistance (1KΩ), Diode (IN4007) and connecting wires.

Theory: When a p-type semiconductor is joined to an n-type semiconductor, the electrons and holes in the region will combine and resulting a lack of carriers in the regions near the junction. This region of uncovered positive and negative ions is called the depletion region. The diode is a two terminal device.

Forward characteristics :

The circuit arrangement for obtaining forward characteristics of diode is shown in fig. In this circuit, the diode is connected to a variable dc supply and to a resistance R_1. The resistance RL is included in the circuit so as to limit the current through the diode.





Experiment :

Date

Page No. 9

If excessive current is permitted to flow through a diode, it may get permanently damaged. A voltmeter is connected across the diode to measure the voltage whereas milliammeter measures current in the circuit. In the forward bias, positive terminal of the voltage source is connected to the anode of a diode and negative terminal to the cathode. Let us gradually increase the voltage in small steps about 0.1V and record the corresponding values of diode current. Now if we plot a graph with voltage across the diode along the horizontal axis and diode current along vertical axis, we shall get a curve called the forward characteristics of p-n junction diode. When the diode is forward biased, the barrier potential is reduced. The mjority carriers diffuse across the junction as the applied bias increases in magnitude the depletion region will continue to decrease in width until a flood of electrons can pass through the junction, resulting in an exponential rise in current. The voltage at which this happens is called Knee voltage. Its value is equal to

LTA

Sep 23, 2024, 20:54

S-NO.	Forward Bias		Reverse Bias	
	V_F (Volt)	I_F (mA)	V_R (Volt)	I_R (mA)
1)	0.42V	0.02mA	0.42V	0
2)	0.47V	0.07mA	0.47V	0
3)	0.49V	0.13mA	0.49V	0
4)	0.53V	0.29mA	0.53V	0
5)	0.55V	0.43mA	0.55V	0
6)	0.57V	0.70mA	0.57V	0
7)	0.60V	1.09mA	0.60V	0
8)	0.63V	2.09mA	0.63V	0
9)	0.66V	3.69mA	0.66V	0
10)	0.69V	6.81mA	0.69V	0
11)	0.70V	7.66mA	0.70V	0
12)	0.70V	8.25mA	0.70V	0
13)	0.70V	9.95mA	0.70V	0
14)	0.70V	10.80mA	0.70V	0
15)	0.70V	11.42mA	0.70V	0

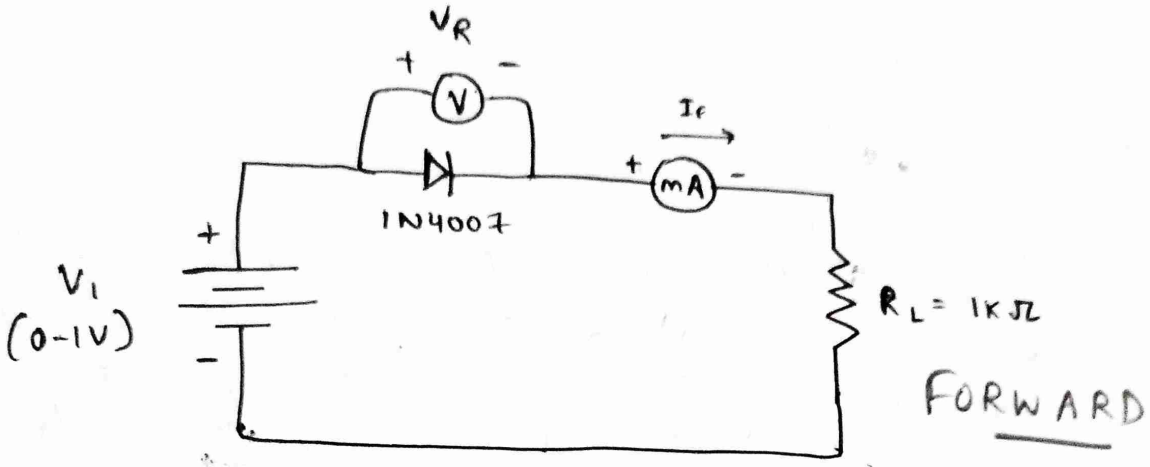
0.7V for Si and 0.3V for Ge.

Reverse Characteristics:

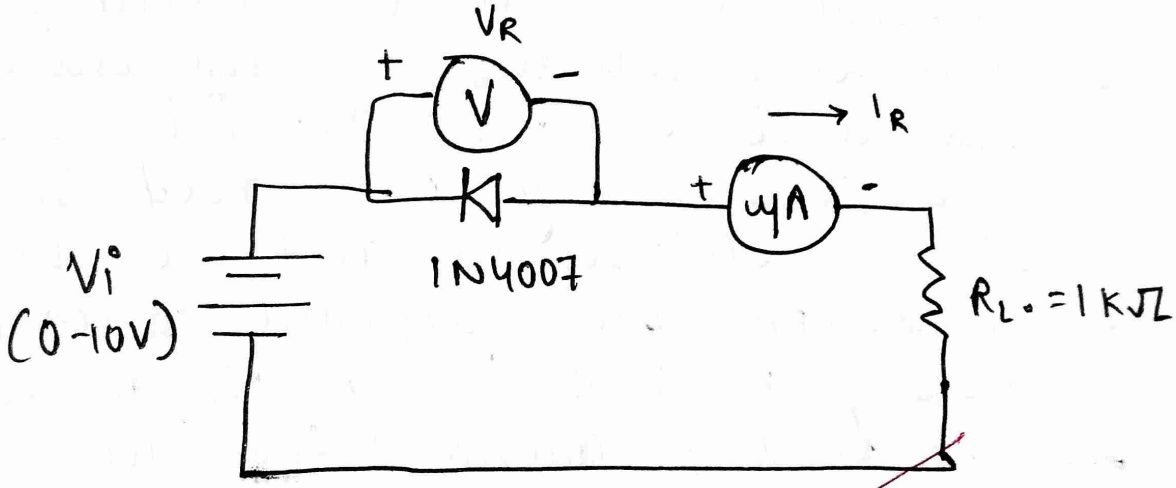
The circuit arrangement for obtaining the reverse characteristics of diode is shown in fig. The negative terminal of the voltage source is connected to terminal of the source is connected to terminal of the source is connected to cathode so a diode. Hence the diode is reverse biased. The applied reverse voltage is gradually increased in suitable steps and the values of diode current are recorded at each step.

Now if we plot the graph with reverse voltage along the horizontal axis and the diode current along the vertical axis, we got a curve referred to as reverse characteristic of diode.

A useful study of reverse characteristic indicates that when the applied reverse voltage is along the breakdown voltage. (V_{BR}), the diode current is small and remains constant.



FORWARD



REVERSE

Sep 23, 2024, 20:55

Experiment :

Date

Page No. 11

STATIC RESISTANCE : S.R. of a diode is given by contangent of angle α.

$$R_f = V_A / I_A = \cot \alpha \quad *$$

DYNAMIC RESISTANCE : The Resistance offered by diode to ac signal (small ac current is applied.) dynamic or ac resistance. The ac resistance of a diode at particular voltage, is equal to slope of characteristic at that point.

$$R_f = \Delta V / \Delta I$$

where $\Delta V = V_B - V_A$

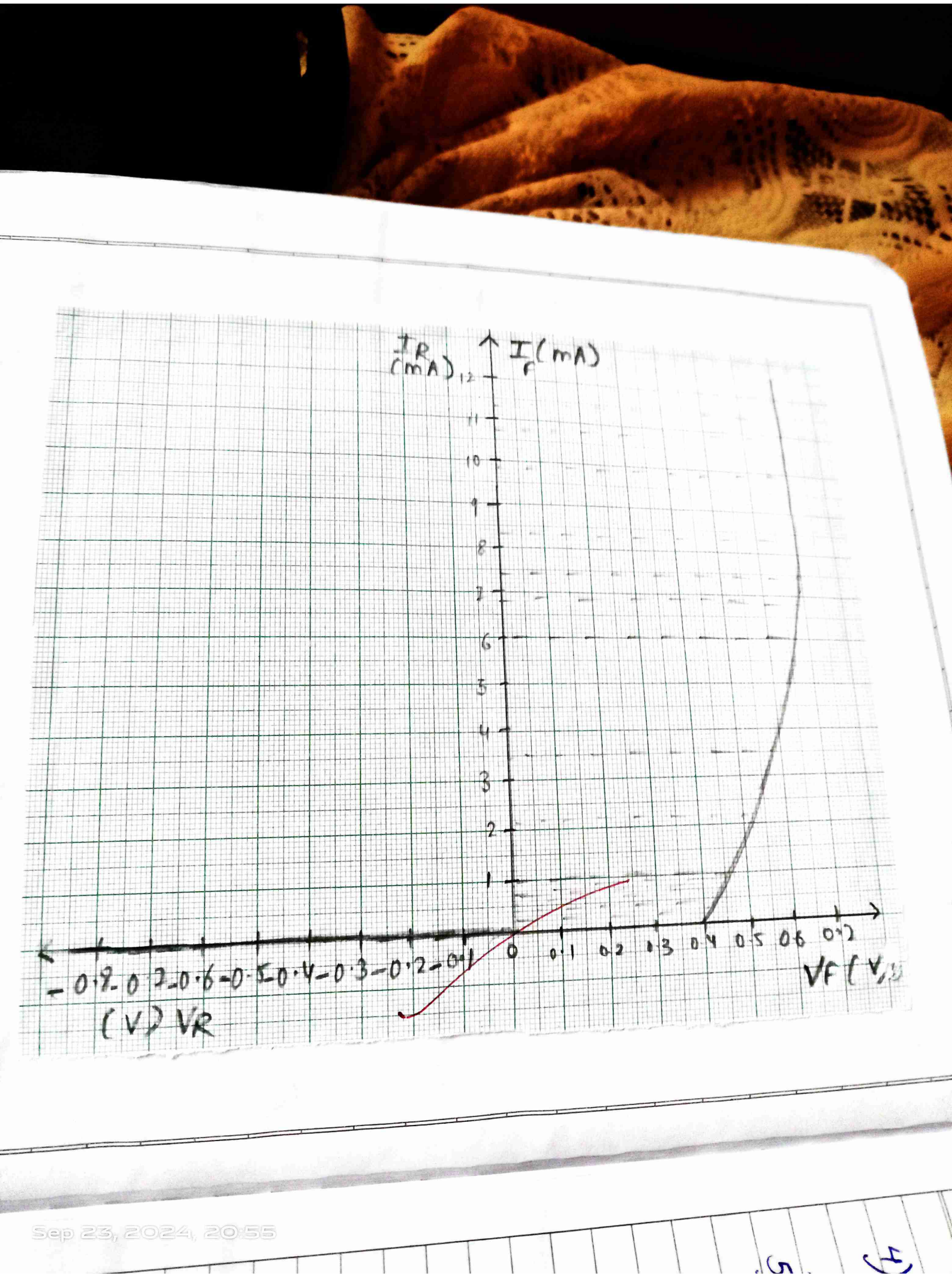
PROCEDURE :

For forward bias :

1) Make connections as shown in circuit diagram
2) Apply variable dc voltage across the diode in FB.
3) Note down the corresponding current from mille-ammeter and voltage from voltmeter repeat the process again.

LTA

Sep 23, 2024, 20:55



4) Plot a graph between forward voltage and forward current. For reverse bias:

5) Now connect the diode in RB and apply variable dc voltage at n-terminal of p-n junction diode.

6) Note down corresponding current from micrometer and voltage from voltmeter, Repeat the process again.

7) Draw the characteristics between R. voltage and R. current.

Calculation:

Comparing practical and theoratical values.

Result:

Thus we have plot the graph for FB and RB modes of diode. We have calculated the forward and reverse resistances by graph.

Experiment :

Date

Page No. 13

PRECAUTIONS :

1) All connections should be tight.
2) All steps should be followed carefully.
3) Readings should be taken carefully.
4) Do not tough live materials.
5) Assume a scale for V-I characteristic in forward and reverse biasing.
6) Never increase RB voltage up to breakdown voltage for an ordinary diode.