ELECTRONIC DEVICES AND CIRCUITS
LABORATORY MANUAL

FOR II / IV B.E (EEE): I - SEMESTER

DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING

SIR C.R.REDDY COLLEGE OF ENGINEERING

ELURU – 534 007

ELECTRONIC DEVICES AND CIRCUITS LAB (EEE2108)

FOR II / IV B.E (EEE), I - SEMESTER

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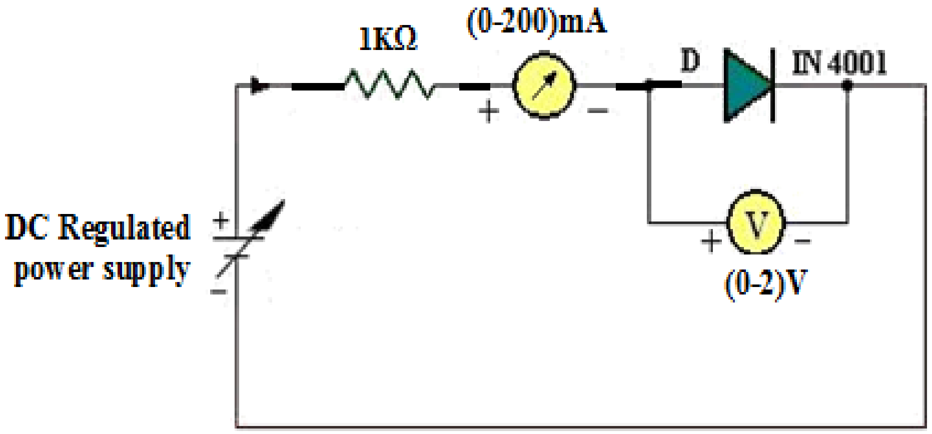
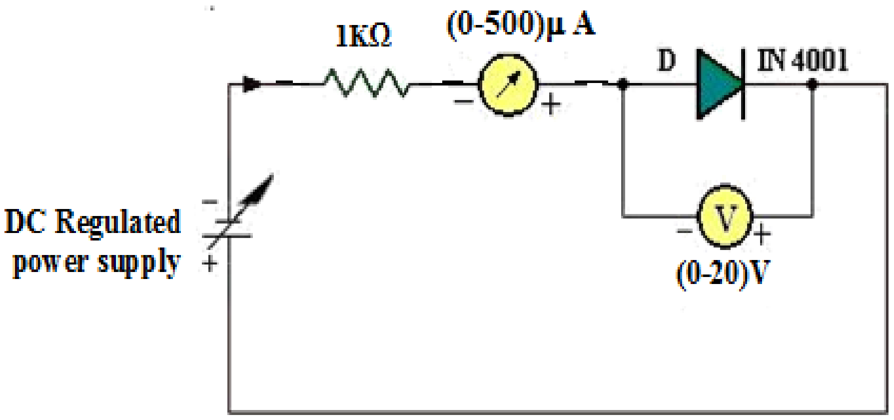
CHARACTERISTICS OF PN JUNCTION DIODE

CIRCUIT DIAGRAMS:

Forward bias Characteristics:



Reverse bias Characteristics:



CHARACTERISTICS OF PN JUNCTION DIODE

Exp. No:……. **Date:………………**

AIM: 1. To Plot the Volt Ampere Characteristics of PN Junction Diode under forward and reverse bias Conditions.
2. To find the Cut-in voltage, Static resistance and dynamic resistance in Forward bias condition.

APPARATUS:

S.No	Name	Range / Value	Quantity
1.	DC Regulated Power Supply	(0 – 30)volts	1
2.	Diode	1N 4001	1
3.	Resistor	1KΩ	1
4.	D.C Ammeters	(0–200)mA, (0–500)μA	Each 1
5.	D.C Volt meters	(0–2)V,(0–20)V	Each 1
6.	Bread Board and connecting wires	-	1 Set

THEORY:

The semi conductor diode is created by simply joining an n-type and a p-type material together nothing more just the joining of one material with a majority carrier of electrons to one with a majority carrier of holes.

The P-N junction supports uni-directional current flow. If +ve terminal of the input supply is connected to anode (P-side) and –ve terminal of the input supply is connected to cathode (N- side), then diode is said to be forward biased. In this condition the height of the potential barrier at the junction is lowered by an amount equal to given forward biasing voltage. Both the holes from p-side and electrons from n-side cross the junction simultaneously and constitute a forward current(injected minority current – due to holes crossing the junction and entering N-side of the diode, due to electrons crossing the junction and entering P-side of the diode).

Assuming current flowing through the diode to be very large, the diode can be approximated as short-circuited switch. If –ve terminal of the input supply is connected to anode (p-side) and +ve terminal of the input supply is connected to cathode (n-side) then the diode is said to be reverse biased. In this condition an amount equal to reverse biasing voltage increases the height of the potential barrier at the junction. Both the holes on p-side and electrons on n-side tend to move away from the junction thereby increasing the depleted region. However the process cannot continue indefinitely, thus a small current called reverse saturation current continues to flow in the diode. This small current is due to thermally generated carriers. Assuming current flowing through the diode to be negligible, the diode can be approximated as an open circuited switch.

The volt-ampere characteristics of a diode explained by following equation:

$$I = I_0 \left(e^{\frac{V}{\eta V_T}} - 1\right)$$

I=current flowing in the diode I_0=reverse saturation current V=voltage applied to the diode

V_T = volt-equivalent of temperature

η = 1 (for Ge)

η = 2 (for Si)

It is observed that Ge diode has smaller cut-in-voltage when compared to Si diode. The reverse saturation current in Ge diode is larger in magnitude when compared to silicon diode.

PROCEDURE:

FORWARD BIAS CHARACTERISTICS:

1. Connect the Circuit as per the Circuit Diagram on the bread board.
2. Switch on the Regulated Power Supply and slowly increase the source voltage. Increase the Diode Current in steps of 2mA and note down the corresponding voltage across the PN junction Diode under forward Bias condition as per table given below.
3. Take the readings until a Diode Current of 20mA.
4. Plot the graph V_F versus I_F on the graph Sheet .
5. From the graph find out the Static & Dynamic forward Bias resistance of the diode

$$R_{dc} = \frac{V_F}{I_F}, \qquad R_{ac} = \frac{\Delta V_F}{\Delta I_F}.$$

6. Observe and note down the cut in Voltage of the diode.

REVERSE BIAS CHARACTERISTICS:

1. Connect the Circuit as per the Circuit Diagram on the bread board.
2. Switch on the Regulated Power Supply and slowly increase the source voltage. Increase the Diode voltage in steps of 2.0 volts and note down the corresponding

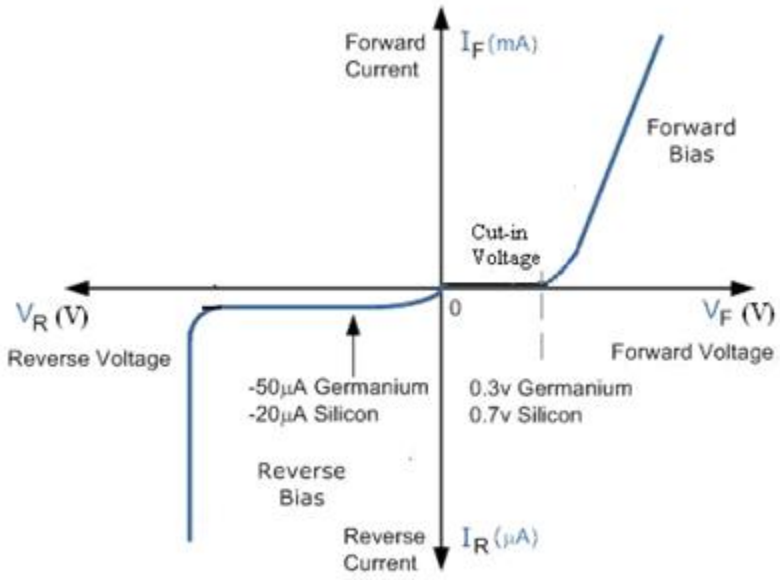
Current against the Voltage under Reverse Bias condition as per table given below.

3. Take readings until a Diode Voltage reaches 20V
4. Plot the graph V_R versus I_R on the graph Sheet.
5. From the graph find out the Dynamic Reverse Bias resistance of the diode.

$$R = \frac{V_R}{I_R}, \qquad r_{ac} = \frac{\Delta V_R}{\Delta I_R}.$$

MODEL GRAPH:

V-I Characteristics of PN junction diode:



TABULAR FORMS:

FORWARD BIAS:

S.No	Voltmeter Reading V_F(Volts)	Ammeter Reading I_F (mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

REVERSE BIAS:

S.No	Voltmeter Reading V_R (Volts)	Ammeter Reading I_R (μA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at Zero volts before Start.
3. All the contacts must be intact.

RESULT:

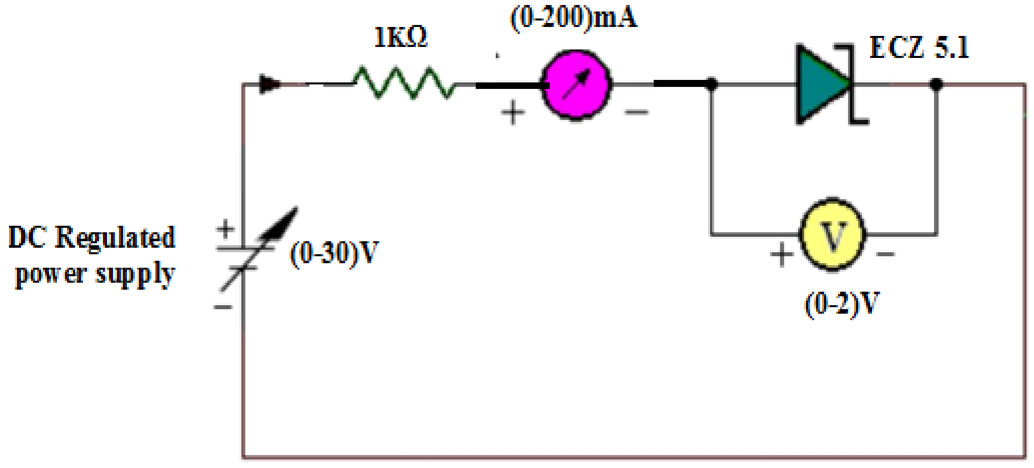
VIVA QUESTIONS:

1. Draw the circuit symbol of the Diode?
2. What are the materials used for Anode and Cathode?
3. Draw ideal Diode Volt Ampere Characteristics?
4. What is cut in Voltage?
5. Explain the working of a Diode as a switch
6. What is space charge?
7. What is Diffusion Capacitance?
8. What are Minority and Majority carriers in P type and in N type materials?
9. What are the specifications of a Diode?
10. What are the applications of PN junction diode?

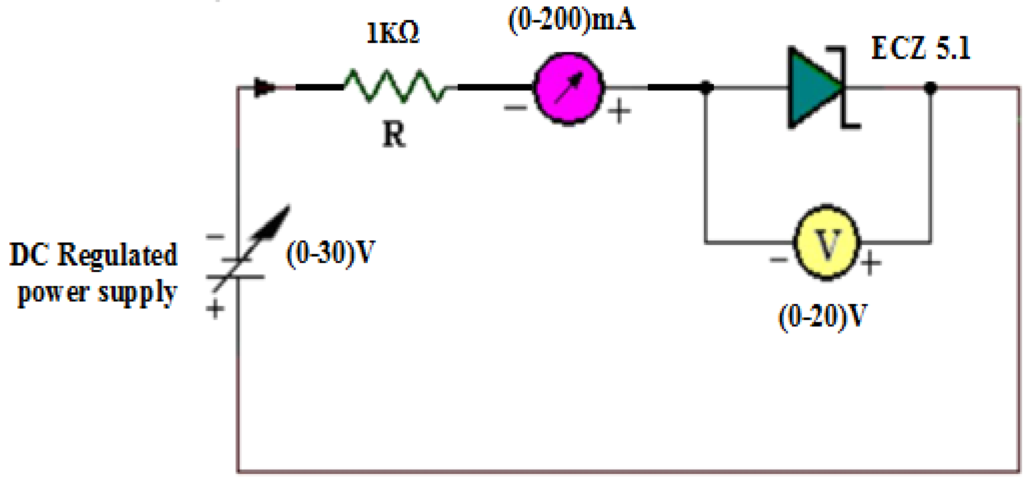
CHARACTERISTICS OF ZENER DIODE

CIRCUIT DIAGRAMS:

Forward Bias Characteristics:



Reverse Bias Characteristics:



CHARACTERISTICS OF ZENER DIODE

Exp.No:……. **Date:………….**

AIM: i) To Obtain the Forward Bias and Reverse Bias characteristics of a Zener diode.
ii) Find out the Zener Break down Voltage from the Characteristics.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	DC Regulated Power Supply	(0 – 30)volts	1
2	Diode	ECZ 5.1	1
3	Resistor	1KΩ	Each 1
4	D.C Ammeters	(0–200)mA	1
5	D.C Volt meters	(0–2)V, (0–20)V	Each 1
6	Decade Resistance Box	-	1
7	Bread Board and connecting wires	-	1 Set

THEORY:

An ideal P-N Junction diode does not conduct in reverse biased condition. A zener diode conducts excellently even in reverse biased condition. These diodes operate at a precise value of voltage called break down voltage. A zener diode when forward biased behaves like an ordinary P-N junction diode.

A zener diode when reverse biased can either undergo avalanche break down or zener break down. Avalanche break down:-If both p-side and n-side of the diode are lightly doped, depletion region at the junction widens. Application of a very large electric field at the junction may rupture covalent bonding between electrons. Such rupture leads to the generation of a large number of charge carriers resulting in avalanche multiplication.

Zener breakdown:- If both p-side and n-side of the diode are heavily doped, depletion region at the junction reduces. Application of even a small voltage at the junction ruptures covalent bonding and generates large number of charge carriers. Such sudden increase in the number of charge carriers results in zener mechanism.

PROCEDURE:

FORWARD BIAS CHARACTERISTICS:

1. Connect the Circuit as per the Circuit Diagram on the bread board.
2. Switch on the Regulated Power Supply and slowly increase the source voltage. Increase the Diode voltage in steps of 2V and note down the corresponding current across the Zener Diode under forward Bias condition as per table given below.
3. Take the readings until the source Voltage of 20V

4. Plot the graph V_F versus I_F on the graph Sheet in the 1st quadrant as in Fig.
5. From the graph find out the Static & Dynamic forward Bias resistance of the diode

$$R_{dc} = \frac{V_F}{I_F}, \qquad R_{ac} = \frac{\Delta V_F}{\Delta I_F}.$$

REVERSE BIAS CHARACTERISTICS:

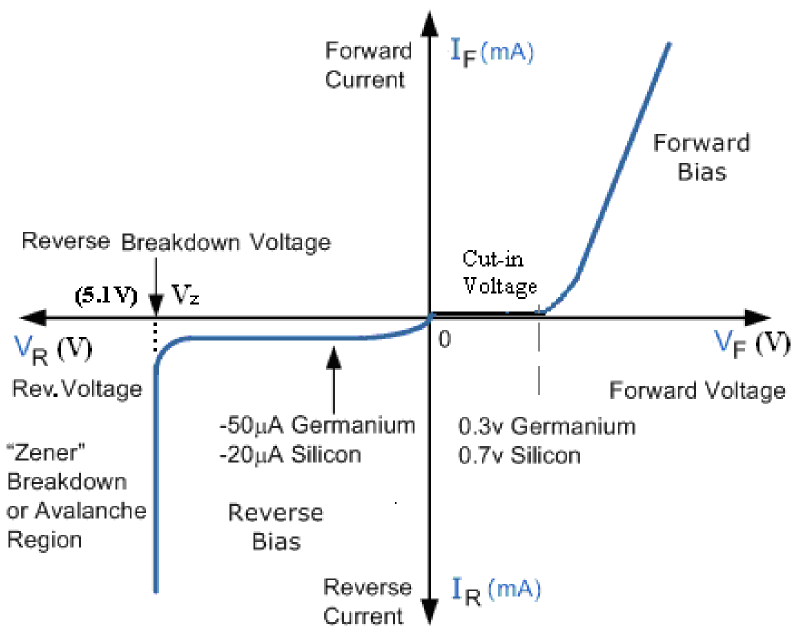
1. Connect the Circuit as per the Circuit Diagram on the bread board.
2. Switch on the Regulated Power Supply and slowly increase the source voltage. Increase the Diode voltage in steps of 2V and note down the corresponding current across the Zener Diode under Reverse Bias condition as per table given below.
3. Take the readings until the source voltage of 20V.
4. Plot the graph V_R versus I_R on the graph Sheet in the 3rd quadrant as in Fig.
5. From the graph find out the Dynamic Reverse Bias resistance of the diode.

$$R_{dc} = \frac{V_R}{I_R}, \qquad R_{ac} = \frac{\Delta V_R}{\Delta I_R}.$$

7. Observe and note down the break down Voltage of the diode.

MODEL GRAPH:

V-I Characteristics of Zener Diode:



TABULAR FORMS:

FORWARD BIAS:

S.No	Voltmeter Reading V_F(Volts)	Ammeter Reading I_F (mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

REVERSE BIAS:

S.No	Voltmeter Reading V_R (Volts)	Ammeter Reading I_R (mA)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

RESULT:

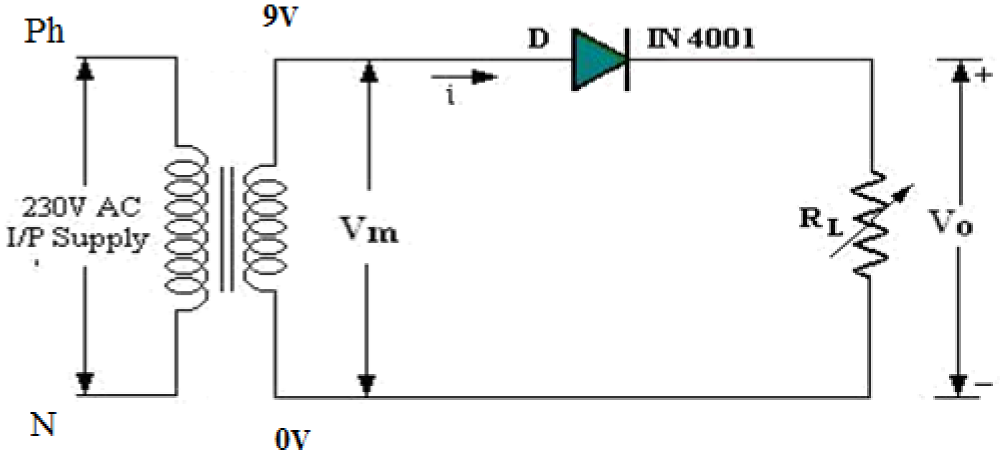
VIVA QUESTIONS:

1. Draw the circuit symbol of the Zener Diode
2. What is meant by Zener break down?
3. What are the different types of breakdowns?
4. What is the difference between Avalanche Zener break down?
5. In a lightly doped and heavily doped diode which type of breakdown occurs?
6. Why Zener breakdown and Avalanche Breakdown voltage increase with temperature?
7. What are the applications of Zener diode?
8. Explain operation of Zener diode as Voltage Regulator?
9. What is the difference between normal PN Junction diode and Zener diode?
10. What is a Regulation?

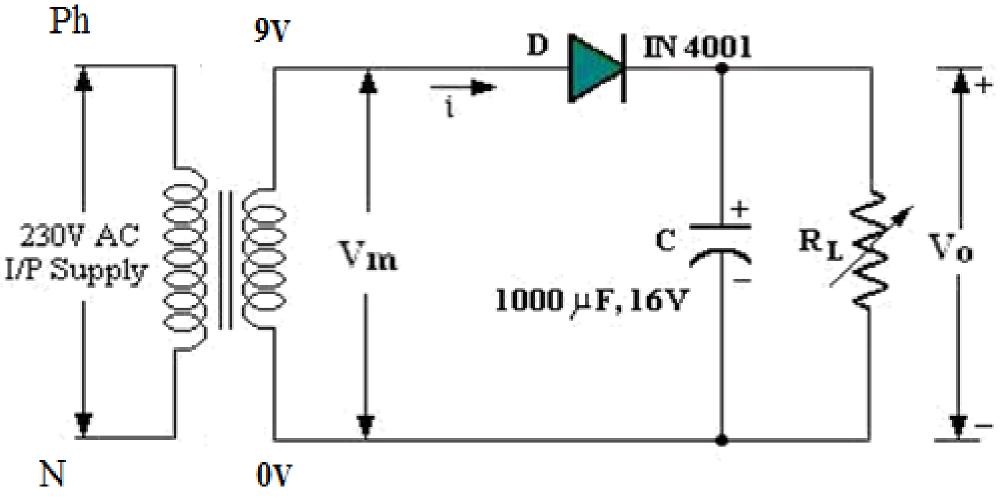
HALF WAVE RECTIFIER WITH AND WITHOUT FILTER

CIRCUIT DIAGRAMS:

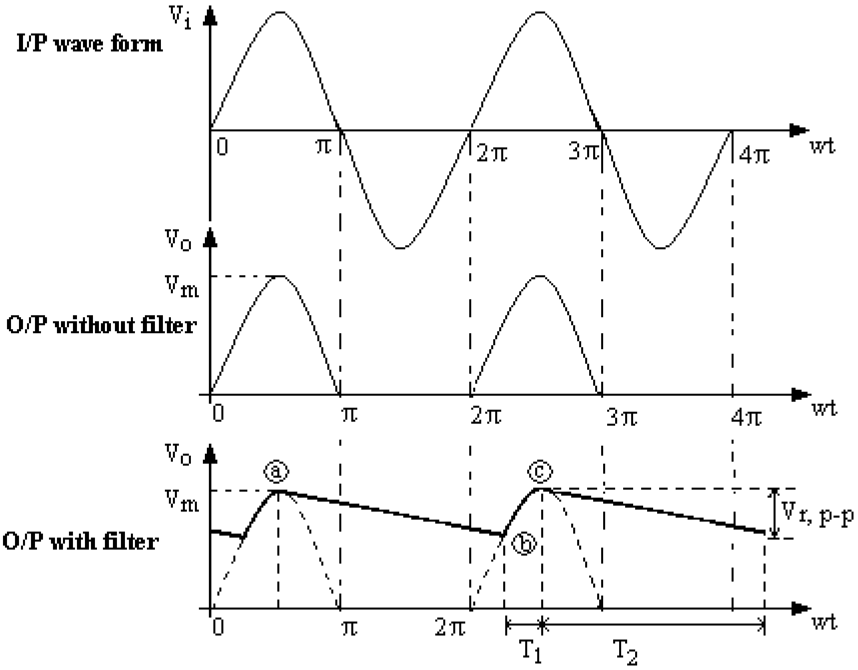
Half wave Rectifier without filter:



Half wave Rectifier with filter:



MODEL WAVEFORMS:



Half-wave Rectifier with capacitor filter wave form

HALF-WAVE RECTIFIER WITH AND WITHOUT FILTER

Exp. No:……. **Date:………………**

AIM: To Rectify the AC signal and then to find out Ripple factor and percentage of Regulation in Half wave rectifier with and without Capacitor filter.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Transformer	230V / 9V	1
2	Diode	1N4001	1
3	Capacitors	1000µF/16V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1 Set
7	Dual Trace CRO	20MHz	1

THEORY:

A device is capable of converting a sinusoidal input waveform into a unidirectional waveform with non zero average component is called a rectifier.

A practical half wave rectifier with a resistive load is shown in the circuit diagram. During the positive half cycle of the input the diode conducts and all the input voltage is dropped across R_L. During the negative half cycle the diode is reverse biased and it acts as almost open circuit so the output voltage is zero.

The filter is simply a capacitor connected from the rectifier output to ground. The capacitor quickly charges at the beginning of a cycle and slowly discharges through R_L after the positive peak of the input voltage. The variation in the capacitor voltage due to charging and discharging is called ripple voltage. Generally, ripple is undesirable, thus the smaller the ripple, the better the filtering action.

PROCEDURE:

Without Filter:

1. Connect the circuit as per the Fig.1
2. Keep the Load Resistance (DRB) at 100 ohms.
3. Apply A.C voltage and take the V_{ac} and V_{dc} Readings with the help of Multimeter.
4. Repeat the above step by varying the load resistance in steps of 100 ohms
5. Tabulate the readings.
6. Disconnect the DRB and note the Vdc at no load condition.

7. Calculate ripple factor $= \left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$

8. Calculate Percentage of Regulation $= \left(\frac{V_{NL}-V_{FL}}{V_{NL}}\times 100\%\right)$

With Capacitor Filter:

1. Connect the circuit diagram as in fig 2 and repeat the method followed in the earlier case and tabulate the readings.
2. Calculate the Ripple factor and Percentage of Regulation.
3. Calculate ripple factor $= \left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$
4. Calculate Percentage of Regulation $= \left(\frac{V_{NL}-V_{FL}}{V_{NL}}\times 100\%\right)$

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) =

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL}-V_{FL}}{V_{NL}}\times 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH FILTER:

V no load Voltage (Vdc) =

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at Zero volts before Start.
3. All the contacts must be intact.

RESULT:

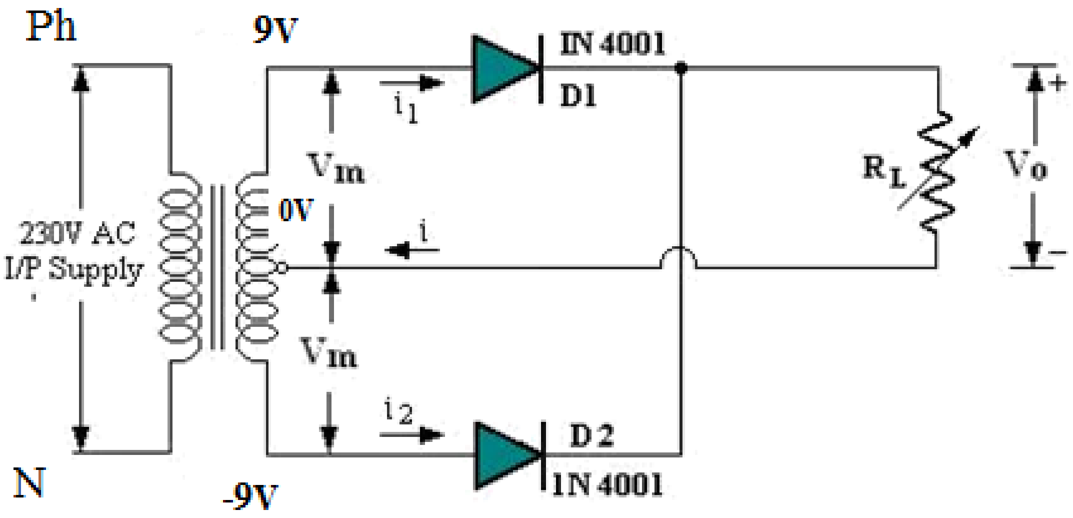
VIVA QUESTIONS:

1. What is a rectifier?
2. How Diode acts as a rectifier?
3. What is the significance of PIV? What is the condition imposed on PIV?
4. Draw the o/p wave form without filter?
5. Draw the o/p wave form with filter?
6. What is meant by ripple factor? For a good filter whether ripple factor should be high or low?
7. What is meant by regulation?
8. What is meant by time constant?
9. What happens to the o/p wave form if we increase the capacitor value?
10. What happens if we increase the capacitor value?

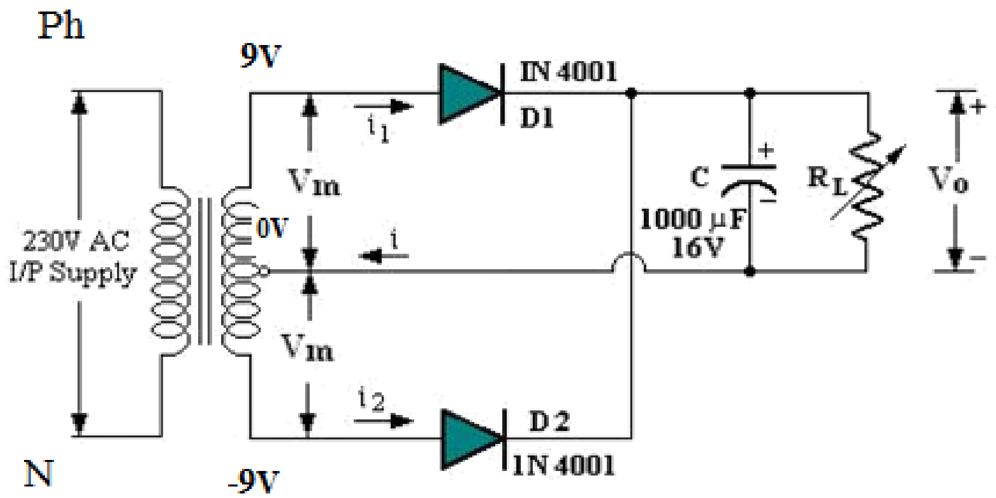
FULL WAVE RECTIFIER WITH AND WITHOUT FILTER

CIRCUIT DIAGRAMS:

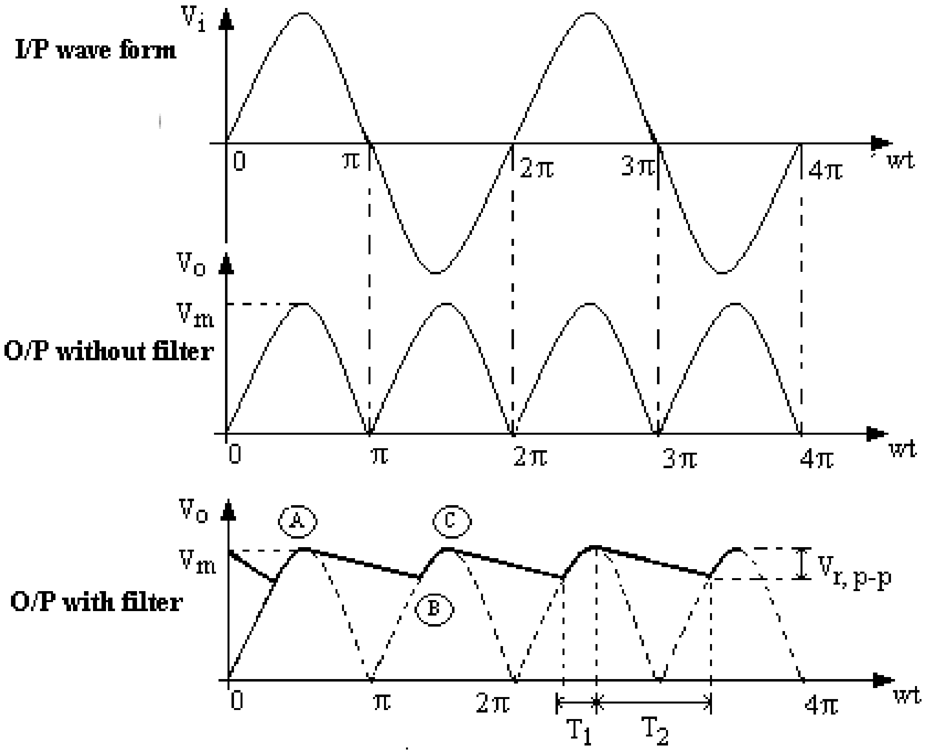
Full wave Rectifier without filter:



Full wave Rectifier with filter:



MODEL WAVEFORMS:



Full-wave Rectifier with capacitor filter wave form

FULL WAVE RECTIFIER WITH AND WITHOUT FILTER

Exp. No:……. **Date:………………**

AIM: To Rectify the AC signal and then to find out Ripple factor and percentage of Regulation in Full-wave rectifier with and without Capacitor filter.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Transformer	230V / 9-0-9V	1
2	Diode	1N4001	2
3	Capacitors	1000μF/16V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1
7	Dual Trace CRO	20MHz	1

THEORY:

A device is capable of converting a sinusoidal input waveform into a unidirectional waveform with non zero average component is called a rectifier. A practical half wave rectifier with a resistive load is shown in the circuit diagram. It consists of two half wave rectifiers connected to a common load. One rectifies during positive half cycle of the input and the other rectifying the negative half cycle. The transformer supplies the two diodes (D1 and D2) with sinusoidal input voltages that are equal in magnitude but opposite in phase. During input positive half cycle, diode D1 is ON and diode D2 is OFF. During negative half cycle D1 is OFF and diode D2 is ON. Generally, ripple is undesirable, thus the smaller the ripple, the better the filtering action

PROCEDURE:

Without Filter:

1. Connect the circuit as per the Fig.1
2. Keep the Load Resistance (DRB) at 100 ohms.
3. Apply A.C voltage and take the V_{ac} and V_{dc} Readings with the help of Multimeter.
4. Repeat the above step by varying the load resistance in steps of 100 ohms
5. Tabulate the readings.
6. Disconnect the DRB and note the Vdc at no load condition.
7. Calculate ripple factor = $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$
8. Calculate Percentage of Regulation = $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$

With Capacitor Filter:

1. Connect the circuit diagram as in fig 2 and repeat the method followed in the earlier case and tabulate the readings.
2. Calculate the Ripple factor and Percentage of Regulation.
3. Calculate ripple factor $= \left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$
4. Calculate Percentage of Regulation = $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) =

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH FILTER:

V no load Voltage (Vdc) =

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at Zero volts before Start.
3. All the contacts must be intact.

RESULT:

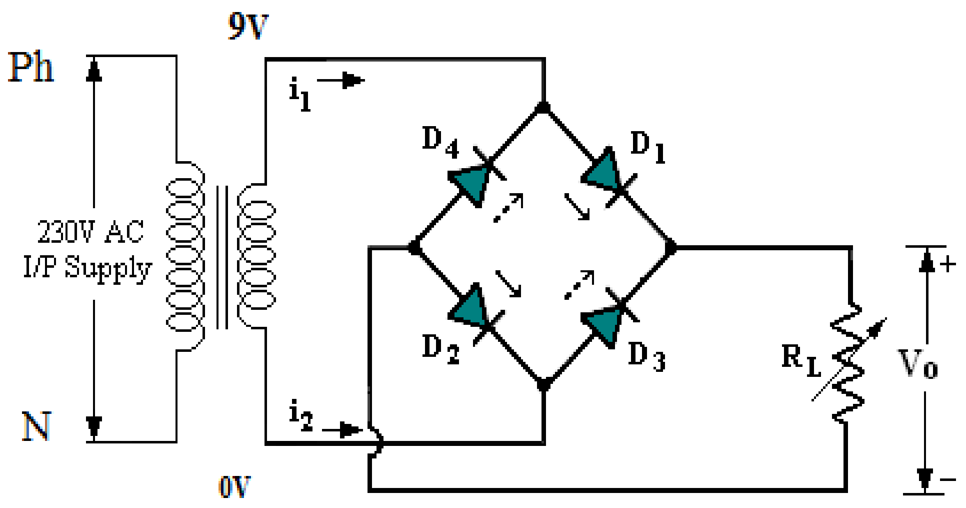
VIVA QUESTIONS:

1. What is a full wave rectifier?
2. How Diode acts as a rectifier?
3. What is the significance of PIV requirement of Diode in full-wave rectifier?
4. Compare capacitor filter with an inductor filter?
5. Draw the o/p wave form without filter? Draw the O/P? What is wave form with filter?
6. What is meant by ripple factor? For a good filter whether ripple factor should be high or low? What happens to the ripple factor if we insert the filter?
7. What is meant by regulation? Why regulation is poor in the case of inductor filter?
8. What is meant by time constant?
9. What happens to the o/p wave form if we increase the capacitor value? What happens if we increase the capacitor value?
10. What is the theoretical maximum value of ripple factor for a full wave rectifier?

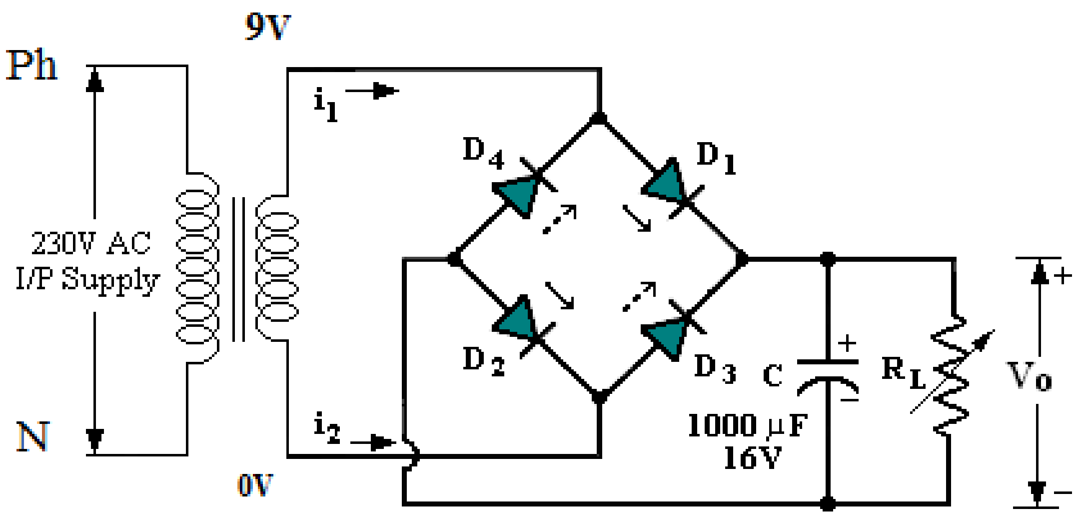
BRIDGE RECTIFIER WITH AND WITHOUT FILTER

CIRCUIT DIAGRAMS:

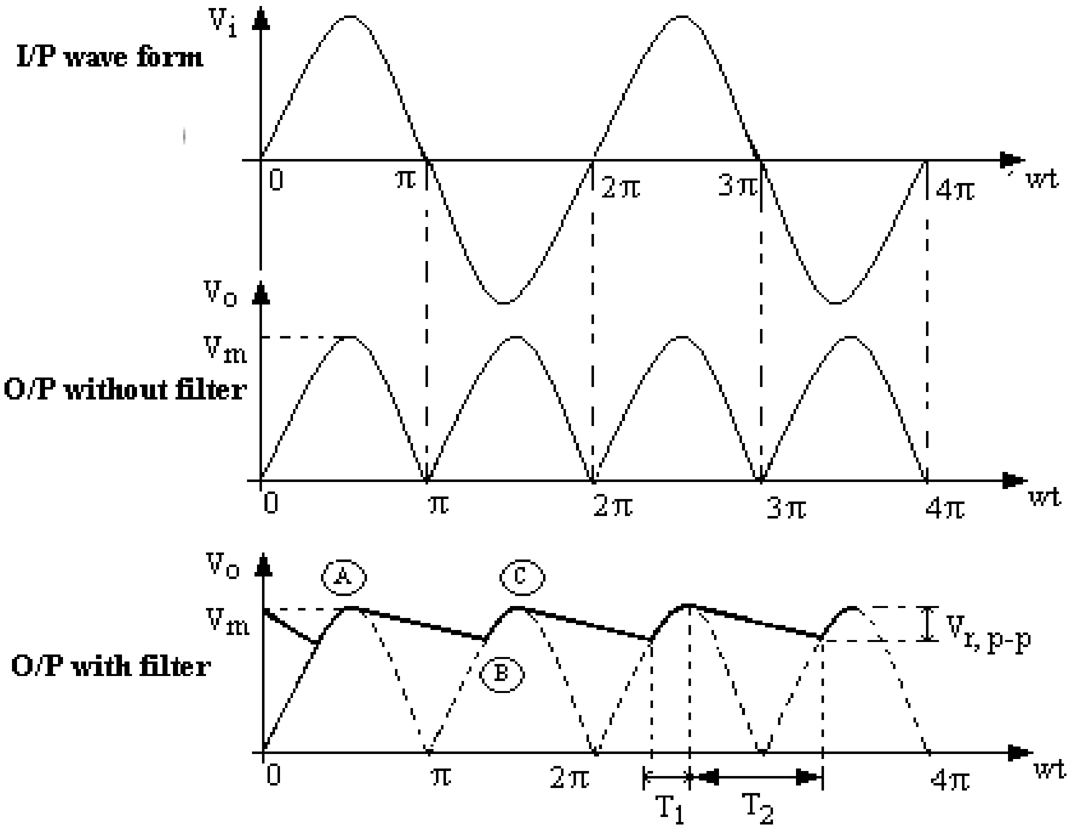
Bridge rectifier without filter:



Bridge rectifier with filter:



MODEL WAVEFORMS:



Bridge Rectifier with capacitor filter wave form

BRIDGE RECTIFIER WITH AND WITHOUT FILTER

Exp. No:……. **Date:………………**

AIM: To Rectify the AC signal and then to find out Ripple factor and percentage of Regulation in Full-wave Bridge rectifier circuit with and without Capacitor filter.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Transformer	230V / 0-9V	1
2	Diode	1N4001	4
3	Capacitors	1000µF/16V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1
7	Dual Trace CRO	20MHz	1

THEORY:

A device is capable of converting a sinusoidal input waveform into a unidirectional waveform with non zero average component is called a rectifier.

The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier has four diodes connected to form a Bridge. The load resistance is connected between the other two ends of the bridge.

For the positive half cycle of the input ac voltage, diode D1 and D3 conducts whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through R_L .

For the negative half cycle of the input ac voltage, diode D2 and D4 conducts whereas diodes D1 and D3 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL in the same direction as in the previous half cycle. Thus a bidirectional wave is converted into a unidirectional wave.

PROCEDURE:

WITHOUT FILTER:

1. Connect the circuit as per the Fig.1
2. Keep the Load Resistance (DRB) at 100 ohms.
3. Apply A.C voltage and take the V_{ac} and V_{dc} Readings with the help of Multimeter.
4. Repeat the above step by varying the load resistance in steps of 100 ohms

5. Tabulate the readings.
6. Disconnect the DRB and note the Vdc at no load condition.
7. Calculate ripple factor = $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$
8. Calculate Percentage of Regulation = $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$

WITH FILTER:

1. Connect the circuit diagram as in fig 2 and repeat the method followed in the earlier case and tabulate the readings.
2. Calculate the Ripple factor and Percentage of Regulation.
3. Calculate ripple factor = $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$
4. Calculate Percentage of Regulation = $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) =

S.No	**Load Resistance R_L (Ω)**	**O/P Voltage (Vo)**		**Ripple factor** $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	**% of Regulation** $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$
		V_{ac} (V)	**V_{dc} (V)**		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH FILTER:

V no load Voltage (Vdc) =

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} \times 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

PRECAUTIONS:

4. Check the wires for continuity before use.
5. Keep the power supply at Zero volts before Start.
6. All the contacts must be intact.

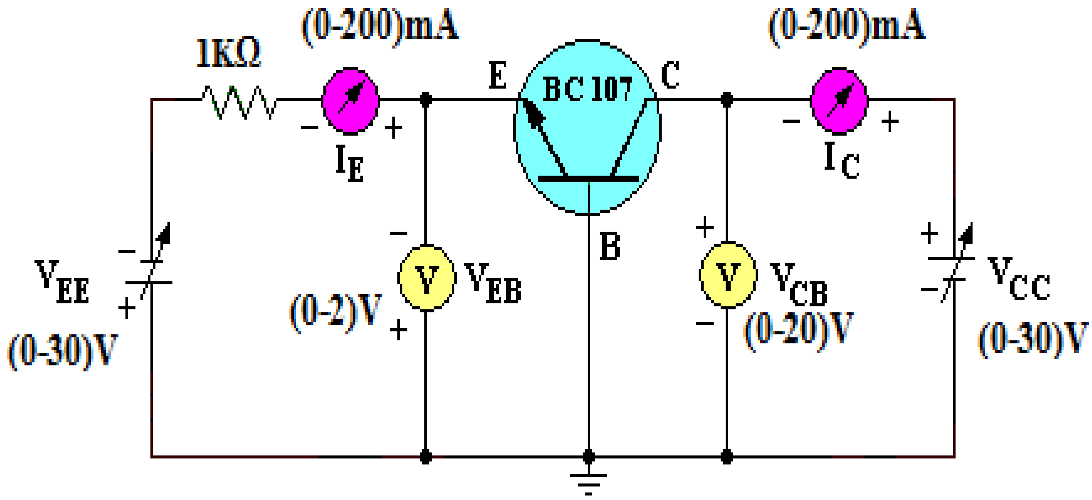
RESULT:

VIVA QUESTIONS:

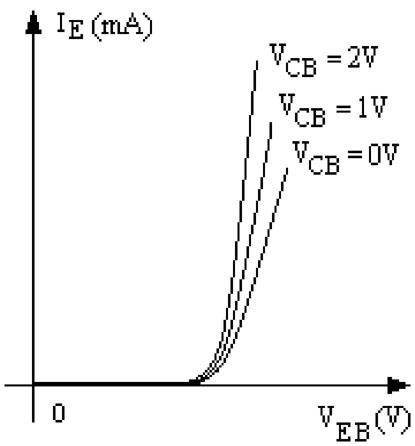
1. What are the advantages of Bridge Rectifier over the center tapped Rectifier?
2. What does Regulation indicate?
3. What is the Theoretical maximum value of Ripple factor of a Full-wave Rectifier?
4. What is the PIV requirement of a Diode in a Bridge Rectifier?
5. Explain the operation of Bridge Rectifier?
6. Which direction the load current flows in full wave rectifier?
7. What is the significance of transformer in rectifier?
8. Compare half wave, full wave and Bridge rectifiers from the point of view of rectification efficiency?
9. What is the effect of turn’s ratio on full-wave rectifier output voltage?
10. Why do we need filters in a power supply? Under what condition we shall prefer a capacitor filter?

CB TRANSISTOR CHARACTERISTICS

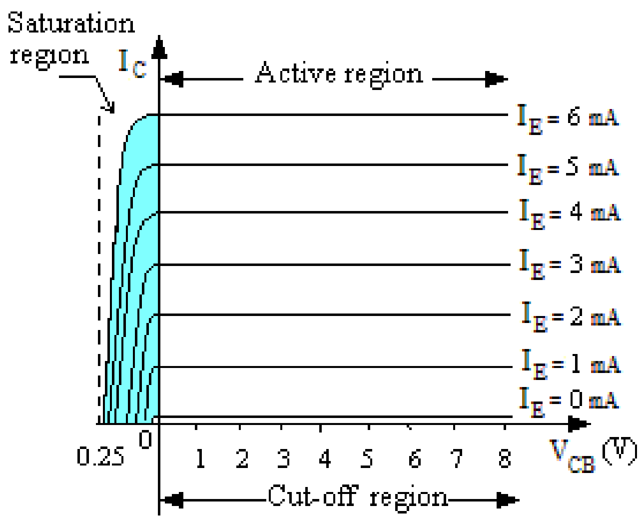
CIRCUIT DIAGRAM:



MODEL GRAPHS:



CB I/P Characteristics



CB O/P Characteristics

COMMON BASE TRANSISTOR CHARACTERISTICS

Exp. No:……. **Date:………………**

AIM: To plot the Input and Output characteristics of a transistor connected in Common Base Configuration and to find the h – parameters from the characteristics.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Dual Regulated D.C Power supply	(0–30) Volts	1
2	Transistor	BC107	1
3	Resistors	1KΩ	1
4	DC Ammeters	(0-200)mA	2
5	DC Voltmeters	(0-2)V, (0-20)V	Each 1 No
6	Bread Board and connecting wires	-	1 Set

THEORY:

Bipolar junction transistor (BJT) is a 3 terminal (emitter, base, collector) semiconductor device. There are two types of transistors namely NPN and PNP. It consists of two P-N junctions namely emitter junction and collector junction.

In Common Base configuration the input is applied between emitter and base and the output is taken from collector and base. Here base is common to both input and output and hence the name common base configuration.

Input characteristics are obtained between the input current and input voltage taking output voltage as parameter. It is plotted between V_{EB} and I_E at constant V_{CB} in CB configuration.

Output characteristics are obtained between the output voltage and output current taking input current as parameter. It is plotted between V_{CB} and I_C at constant I_E in CB configuration.

PROCEDURE:

TO FIND THE INPUT CHARACTERISTICS:

1. Connect the circuit as in the circuit diagram.
2. Keep V_{EE} and V_{CC} in zero volts before giving the supply
3. Set V_{CB} = 1 volt by varying V_{CC} and vary the V_{EE} smoothly with fine control such that emitter current I_E varies in steps of 0.2mA from zero upto 20mA, and note down the corresponding voltage V_{EB} for each step in the tabular form.
4. Repeat the experiment for V_{CB} =2 volts and 3 volts.
5. Draw a graph between V_{EB} versus I_E against V_{CB} = Constant.

TO FIND THE OUTPUT CHARACTERISTICS:

1. Start V_{EE} and V_{CC} from zero Volts.
2. Set the I_E = 1mA by using V_{EE} such that, V_{CB} changes in steps of 1.0 volts from zero upto 20 volts, note down the corresponding collector current I_C for each step in the tabular form.
3. Repeat the experiment for I_E = 3mA and I_E = 5mA, tabulate the readings.
4. Draw a graph between V_{CB} Vs I_C against I_E = Constant.

To find the h – parameters:

Calculation of hib:

Mark two points on the Input characteristics for constant V_{CB}. Let the coordinates of these two points be (V_{EB1}, I_{E1}) and (V_{EB2}, I_{E2}).

$$h_{ib} = \frac{V_{EB2} - V_{EB1}}{I_{E2} - I_{E1}};$$

Calculation of hrb:

Draw a horizontal line at some constant I_E value on the input characteristics. Find V_{CB2}, V_{CB1}, V_{EB2}, V_{EB1}

$$h_{rb} = \frac{V_{EB2} - V_{EB1}}{V_{CB2} - V_{CB1}};$$

Calculation of hfb:

Draw a vertical line on the Output characteristics at some constant V_{CB} value. Find I_{c2}, I_{c1} and I_{E2}, I_{E1} .

$$h_{fb} = \frac{I_{C2} - I_{C1}}{I_{E2} - I_{E1}};$$

Calculation of hob:

On the Output characteristics for a constant value of I_E mark two points with coordinates (V_{CB2} , I_{C2}) and (V_{CB1} , I_{C1}) .

$$h_{ob} = \frac{I_{C2} - I_{C1}}{V_{CB2} - V_{CB1}};$$

TABULAR FORMS:

INPUT CHARACTERISTICS:

S.No	V_{CB} = 0V		V_{CB} = 1V		V_{CB} = 2V	
	V_{EB} (V)	I_E (mA)	V_{EB} (V)	I_E (mA)	V_{EB} (V)	I_E (mA)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

OUTPUT CHARACTERISTICS:

S.No	I_E = 1 mA		I_E = 3 mA		I_E = 5 mA	
	V_{CB} (V)	I_C (mA)	V_{CB} (V)	I_C (mA)	V_{CB} (V)	I_C (mA)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

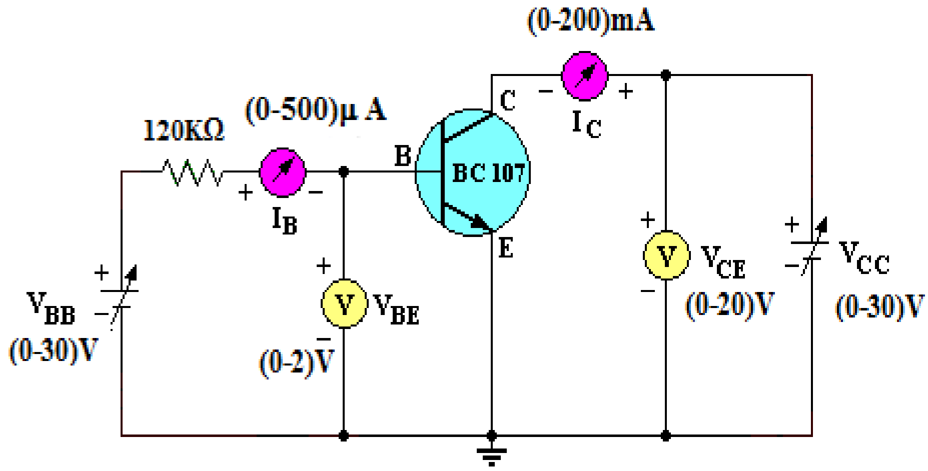
RESULT:

VIVA QUESTION:

1. What is Early effect?
2. Draw the small signal model of BJT Common Base Configuration.
3. What are the applications of Common Base.
4. What will be the parameters of CB.
5. Explain the Transistor operation?
6. Why CB amplifier is useful in RF region?
7. In regulators what is the role of CB transistor mode of operation?
8. What is the symbolic representation of the Current gain in CB mode of operation?
9. How much will be the power gain in CE amplifier?
10. What is relation between α,β and γ?

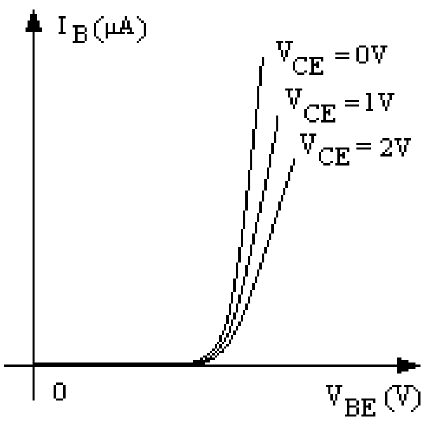
CE TRANSISTOR CHARACTERISTICS

CIRCUIT DIAGRAM:



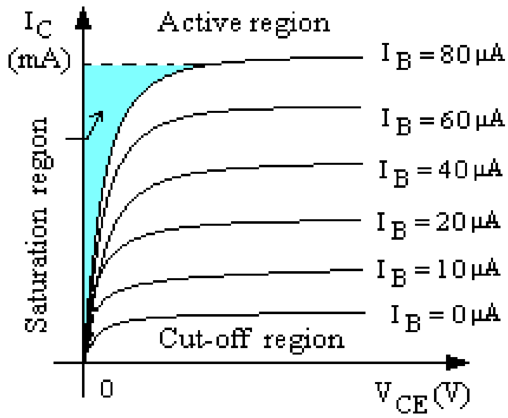
MODEL GRAPHS:

INPUT CHARACTERISTICS:



CE I/P Characteristics

OUTPUT CHARACTERISTICS:



CE O/P Characteristics

COMMON EMITTER TRANSISTOR CHARACTERISTICS

Exp. No:……. **Date:………………**

AIM: To plot the Input and Output characteristics of a transistor connected in Common Emitter Configuration and to find the h – parameters from the characteristics.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Dual Regulated D.C Power supply	(0–30) Volts	1
2	Transistor	BC107	1
3	Resistors	120KΩ	1
4	DC Ammeters	(0-500)μA, (0-200)mA	Each 1 No
5	DC Voltmeters	(0-2)V, (0-20)V	Each 1 No
6	Bread Board and connecting wires	-	1 Set

THEORY:

Bipolar junction transistor (BJT) is a 3 terminal (emitter, base, collector) semiconductor device. There are two types of transistors namely NPN and PNP. It consists of two P-N junctions namely emitter junction and collector junction.

In Common Emitter configuration the input is applied between base and emitter and the output is taken from collector and emitter. Here emitter is common to both input and output and hence the name common emitter configuration.

Input characteristics are obtained between the input current and input voltage taking output voltage as parameter. It is plotted between V_{BE} and I_B at constant V_{CE} in CE configuration.

Output characteristics are obtained between the output voltage and output current taking input current as parameter. It is plotted between V_{CE} and I_C at constant I_B in CE configuration.

PROCEDURE:

TO FIND THE INPUT CHARACTERISTICS:

1. Connect the circuit as in the circuit diagram.
2. Keep V_{BB} and V_{CC} in zero volts before giving the supply

3. Set V_{CE} = 1 volt by varying V_{CC} and vary the V_{BB} smoothly with fine control such that base current I_B varies in steps of 5μA from zero upto 200μA, and note down the corresponding voltage V_{BE} for each step in the tabular form.
4. Repeat the experiment for V_{CE} =2 volts and 3 volts.
5. Draw a graph between V_{BE} Vs I_B against VCE = Constant.

TO FIND THE OUTPUT CHARACTERISTICS:

1. Start V_{EE} and V_{CC} from zero Volts.
2. Set the I_B = 20μA by using V_{BB} such that, V_{CE} changes in steps of 0.2 volts from zero upto 10 volts, note down the corresponding collector current I_C for each step in the tabular form.
3. Repeat the experiment for I_E = 40μA and I_E = 60μA, tabulate the readings.
4. Draw a graph between V_{CE} Vs I_C against I_B = Constant.

TABULAR FORMS:

INPUT CHARACTERISTICS;

S.No	V_{CE} = 0V		V_{CE} = 1V		V_{CE} = 2V	
	V_{BE} (V)	I_B (μA)	V_{BE} (V)	I_B (μA)	V_{BE} (V)	I_B (μA)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

OUTPUT CHARACTERISTICS:

S.No	I_B = 20 μA		I_B = 40 μA		I_B = 60 μA	
	V_{CE} (V)	I_C (mA)	V_{CE} (V)	I_C (mA)	V_{CE} (V)	I_C (mA)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

To find the h – parameters:

Calculation of h_{ie}:

Mark two points on the Input characteristics for constant V_{CE}. Let the coordinates of these two points be (V_{BE1}, I_{B1}) and (V_{BE2}, I_{B2}).

$$h_{ie} = \frac{V_{BE2} - V_{BE1}}{I_{B2} - I_{B1}};$$

Calculation of h_{re}:

Draw a horizontal line at some constant I_B value on the Input characteristics. Find V_{CE2}, V_{CE1}, V_{BE2}, V_{BE1}

$$h_{rb} = \frac{V_{BE2} - V_{BE1}}{V_{CE2} - V_{CE1}};$$

Calculation of h_{fe}:

Draw a vertical line on the out put characteristics at some constant V_{CE} value. Find Ic_2, Ic_1 and I_{B2}, I_{B1} .

$$h_{fe} = \frac{I_{C2} - I_{C1}}{I_{B2} - I_{B1}};$$

Calculation of h_{oe}:

On the Output characteristics for a constant value of I_B mark two points with coordinates (V_{CE2} , I_{C2}) and (V_{CE1} , I_{C1}) .

$$h_{ob} = \frac{I_{C2} - I_{C1}}{V_{CE2} - V_{CE1}} ;$$

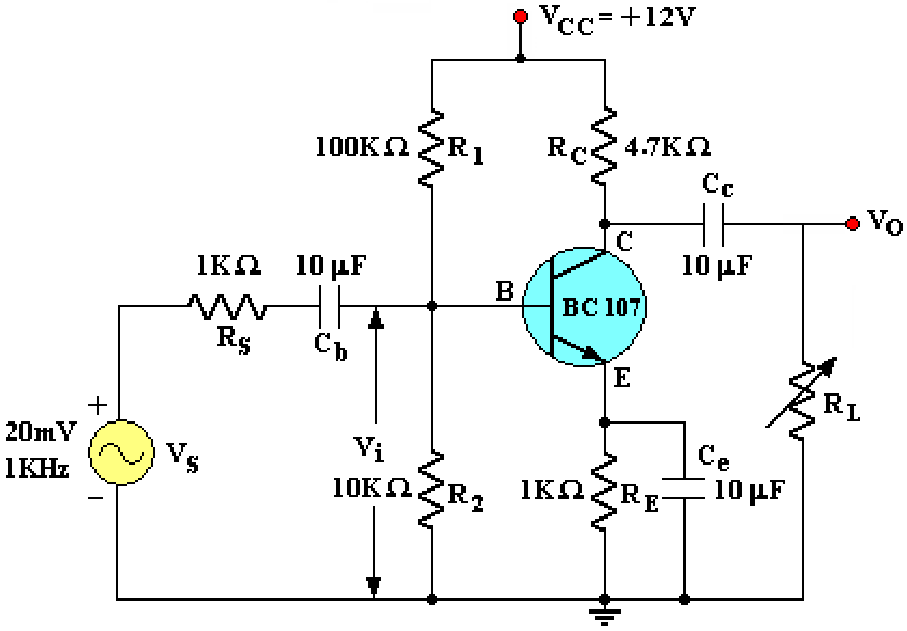
RESULTS:

VIVA QUESTION:

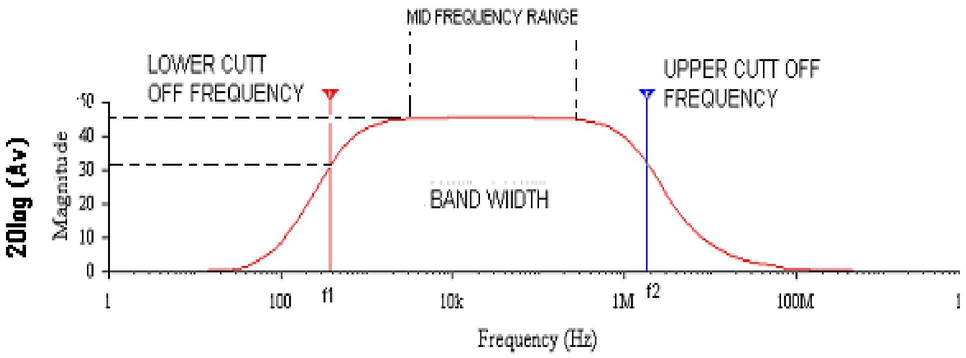
1. Why CE configuration is most widely used?
2. Draw the equivalent Circuit of C.E
3. What is the Current Gain, voltage gain,i/p and o/p impedance in CE?.
4. Relation between „α" and „β" and γ
5. Give the condition to operate the given Transistor in active, saturation &Cut-off Regions
6. What is Emitter Efficiency?
7. How much will be the input dynamic resistance in CE when we compare with CB configuration?
8. How much will be the output dynamic resistance in CE amplifier?
9. Out of three configurations which configuration has highest leakage current?
10. How much will be the power gain in CE amplifier?

CE TRANSISTOR AS AN AMPLIFIER

CIRCUIT DIAGRAM:



MODEL GRAPH:



CE TRANSISTOR AS AN AMPLIFIER

Exp. No:……. **Date:………………**

AIM: To Find the frequency response of a Common Emitter Transistor Amplifier and to find the Bandwidth from the Response, Voltage gain, Input Resistance, output resistance.

APPARATUS:

S.No	Name	Range / Value	Quantity
1.	Regulated D.C Power supply	(0–30) Volts	1
2.	Transistor	BC107	1
3.	Resistors	1KΩ	2
4.	Resistors	100kΩ,10KΩ, 4.7KΩ.	Each 1
5.	Capacitors	10μf	3
6.	Potentio Meter	--	1
7.	Signal Generator	(0 – 1)MHz	1
8.	Dual Trace CRO	20MHz	1
9.	Bread Board and connecting wires	--	1 Set

THEORY:

Bipolar junction transistor (BJT) is a 3 terminal (emitter, base, collector) semiconductor device. There are two types of transistors namely NPN and PNP. It consists of two P-N junctions namely emitter junction and collector junction.

In Common Emitter configuration the input is applied between base and emitter and the output is taken from collector and emitter. Here emitter is common to both input and output and hence the name common emitter configuration.

Input characteristics are obtained between the input current and input voltage taking output voltage as parameter. It is plotted between V_{BE} and I_B at constant V_{CE} in CE configuration.

Output characteristics are obtained between the output voltage and output current taking input current as parameter. It is plotted between V_{CE} and I_C at constant I_B in CE configuration.

PROCEDURE:

1. Connect the circuit as per the circuit diagram.
2. Apply Voltage of 20mV at 1 KHz from the Signal Generator and observe the O/P on CRO.
3. Vary the frequency from 50 Hz to 1MHz in appropriate steps and note down the corresponding O/P Voltage V_o in a tabular form.

TABULAR FORM:

I/P Voltage, V_s = 20mV

S.No	Frequency (Hz)	O/P Voltage, Vo (V)	Voltage Gain Av =Vo/Vi	Av in dB = 20 log (Av)
1	100			
2	200			
3	300			
4	500			
5	700			
6	1K			
7	3K			
8	5K			
9	7K			
10	10K			
11	30K			
12	50K			
13	70K			
14	100K			
15	300K			
16	500K			
17	700K			
18	1M			

CALCULATION OF BANDWIDTH:

1. Calculate the Voltage Gain Av = V_o/V_s and note down in the tabular form.
2. Plot the frequency (f) Vs Gain (A_v) on a Semi-log Graph sheet

3. Draw a horizontal line at 0.707 times A_v and note down the cut off points and the Bandwidth is given by B.W = $f_2 - f_1$.

PRECAUTIONS:

1.Check the wires for continuity before use.

2.Keep the power supply at Zero volts before Start

3.All the contacts must be intact

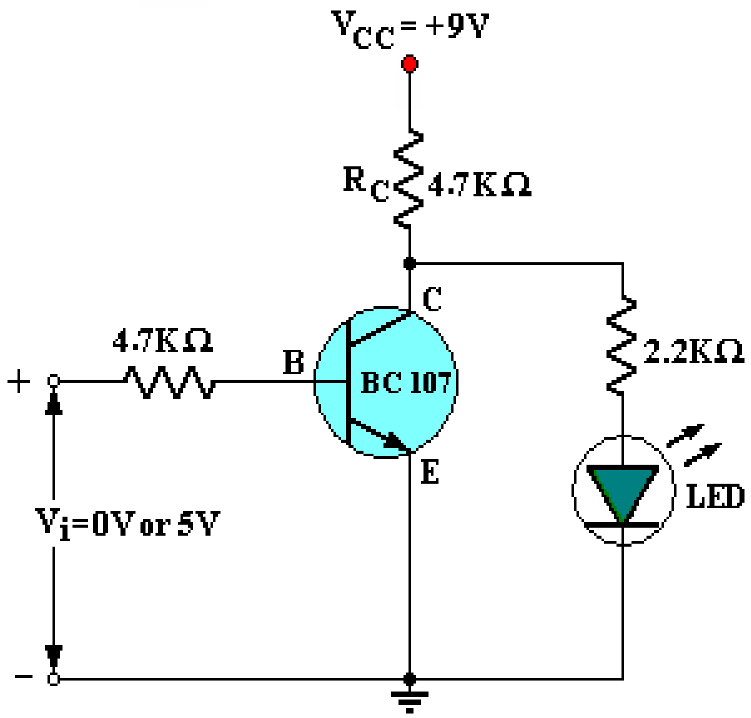
RESULT:

VIVA QUESTIONS:

1. What is an Amplifier?
2. How many types of an Amplifiers?
3. What is meant Band width, Lower cut-off and Upper cut-off frequency?
4. How much phase shift for CE Amplifier?
5. What are the applications?
6. Draw the Equivalent circuit for low frequencies?
7. What is meant by maximum power dissipation?
8. When does the transistor is said to be in saturation region?
9. What is meant by thermal run away?
10. What is the advantage of CC amplifier?

TRANSISTOR AS A SWITCH

CIRCUIT DIAGRAM:



TRANSISTOR AS A SWITCH

Exp. No:……. **Date:………………**

AIM: 1. To observe the action of a Transistor as an electronic switch.

2. To measure the voltage across the transistor when it is ON and when it is OFF.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Regulated D.C Power supply	(0–30)V	1
2	Transistor	BC – 107	1
3	Resistors	4.7K Ω, 2.2K Ω	Each 1
4	LED	-	1
5	Bread Board and connecting wires	-	1 Set

THEORY:

Transistor is used for switching operation for opening or closing of a circuit. This type solid state switching offers significant reliability and lower cost as compared with conventional relays. Both NPN and PNP transistors can be used as switches. Some of the applications use a power transistor as switching device, at that time it may necessary to use another signal level transistor to drive the high power transistor.

NPN Transistor as a Switch:

Based on the voltage applied at the base terminal of a transistor switching operation is performed. When a sufficient voltage (V_{in} > 0.7 V) is applied between the base and emitter, collector to emitter voltage is approximately equal to 0. Therefore, the transistor acts as a short circuit. The collector current V_{cc}/R_c flows through the transistor.

Similarly, when no voltage or zero voltage is applied at the input, transistor operates in cutoff region and acts as an open circuit. In this type of switching connection, load (here LED lamp) is connected to the switching output with a reference point. Thus, when the transistor is switched ON, current will flow from source to ground through the load.

PROCEDURE:

1. Construct the circuit as shown in figure.
2. Connect '0' volts to the input terminals.
3. Measure the voltage across collector to emitter(V_{CE}), collector to base(V_{CB}) and base to emitter(V_{BE}).
4. Connect '5' volts to the input terminals. Measure the voltage across collector to emitter(V_{CE}), collector to base(V_{CB}) and base to emitter(V_{BE}).
5. Observe that the LED glows when the input terminals are supplied with '0' volts. and the LED will not glow when the input is '5' volts.

TABULAR FORM:

Input voltage (V)	V_{CE} (V)	V_{CB} (V)	V_{BE} (V)	Mode ON/OFF	Mode of LED
0 V					
5V					

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at zero volts before staring the experiment.
3. All the connections must be intact.

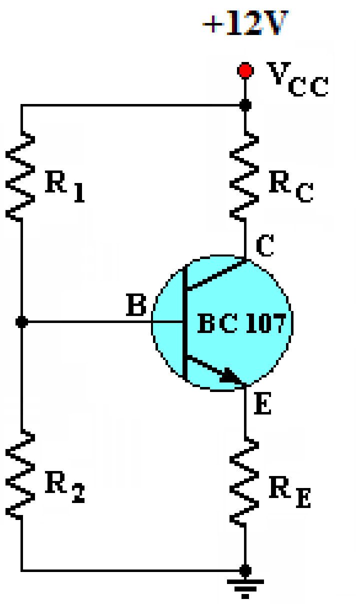
RESULT:

VIVA QUESTIONS:

1. Define ON/OFF time?
2. In which region transistor acts as an open switch?
3. In which region transistor will be in ON region?
4. What do you mean by saturation region?
5. What do you mean by cut off region?
6. What do you mean by active region?
7. What are the advantages of electronic switch over mechanical switch?
8. When a transistor is said to be in a quiescent state?
9. One way in which the operation of an NPN transistor differs from that of a PNP transistor is that?
10. What do you mean by emitter, base and collector of a transistor?

DESIGN OF SELF BIAS CIRCUIT

CIRCUIT DIAGRAM:



DESIGN PROCEDURE:

Icq = 5mA, Vceq = 6.0 V, Vcc = 12.0 V, Rc = 1K, S = 25,Vbe=0.6 V.

Find h_{fe} of the transistor

$S= (1+\beta) / (1+\beta Re / (Re + Rb))$

$V_B = V_{CC}R_2 / (R_1 + R_2)$

$R_B = R_1R_2 / (R_1+R_2)$

$V_B = I_BR_B+ V_{BE} + (1+\beta)I_BR_E$

$V_{CC} = I_CR_C + V_{CE}+(1+\beta)I_BR_E$, & $I_c=\beta I_B$

Using the above formula find Re, R1, R2.

DESIGN OF SELF BIAS CIRCUIT

Exp. No:……. **Date:………………**

AIM: Design a Self Bias Circuit For the following Specifications
h_{fe} = , Icq = 5mA, Vceq = 6.0 V, Vcc = 12.0 V, Rc = 1KΩ, S = 25.

Find the quiescent point (Operating Point) values of I_Cq and $V_{CE}q$ from the experiment and to find the maximum signal handling capability of the Amplifier.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Dual Regulated D.C Power supply	(0–30)V	1
2	Transistor	BC107	1
3	Multimeter	-	1
4	D.C Ammeters	(0–200)mA	1
5	Bread Board and connecting wires	-	1 Set

THEORY:

The collector to base feedback configuration ensures that the transistor is always biased in the active region regardless of the value of Beta (β) as the base bias is derived from the collector voltage.

In this circuit, the base bias resistor, RB is connected to the transistors collector C, instead of to the supply voltage, Vcc. Now if the collector current increases, the collector voltage drops, reducing the base drive and thereby automatically reducing the collector current. Therefore the network balances itself. That is why this method of negative feedback biasing is called self-biasing

PROCEDURE:

1. Connect the circuit as per the circuit diagram.
2. Apply Vcc of 12 Volts DC.
3. Note down the resulting current at collector terminal I_{cq}.
4. Note down the resulting voltage in between collector and emitter terminals $V_{ceq.}$

TABULAR FORM:

Parameter	Theoretical Values	Practical ValuesName
I_C		
V_{CE}		

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at Zero volts before Start
3. All the contacts must be intact

RESULT:

VIVA QUESTIONS:

1.What is meant by Self Bias & fixed Bias circuits, Which one is preferred and why?

2. What is the significance of Emitter Resistance?

3. what are different techniques of stabilization?

4.What is stability factor?

5.what is DC Load line and A.C. Load line?

6.what is quiescent point? What are the various parameters of the transistor that cause drift in q-point?

7.what are different techniques of stabilization?

8.Relate stability factor with the circuit parameters

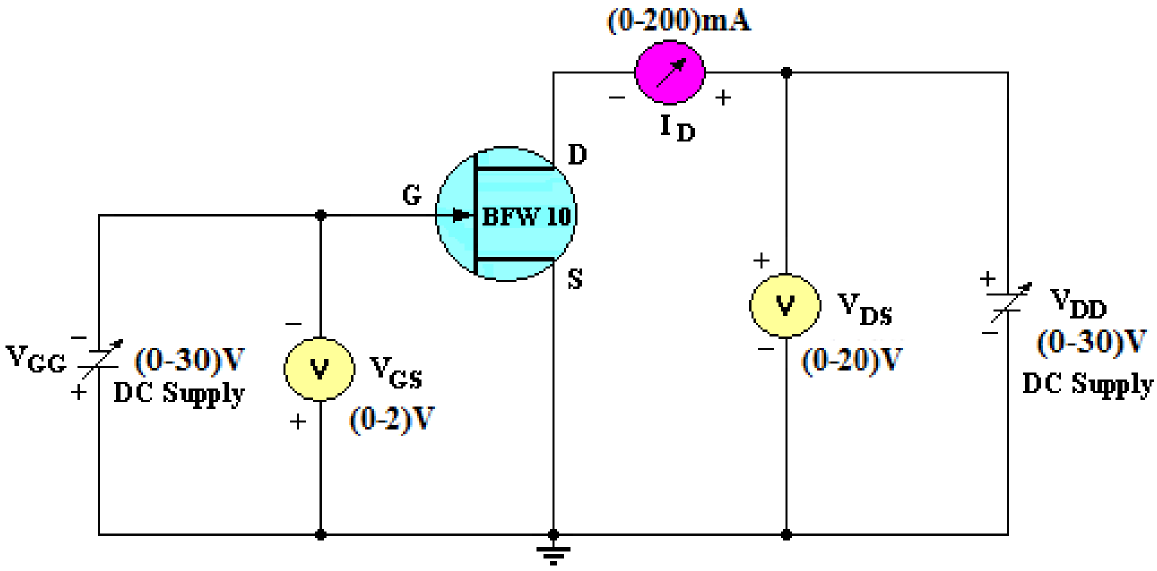
9.What is the relation between α and β.

10.If bypass capacitor is removed ,what happens to the gain?

JFET DRAIN & TRANSFER CHARACTERISTICS

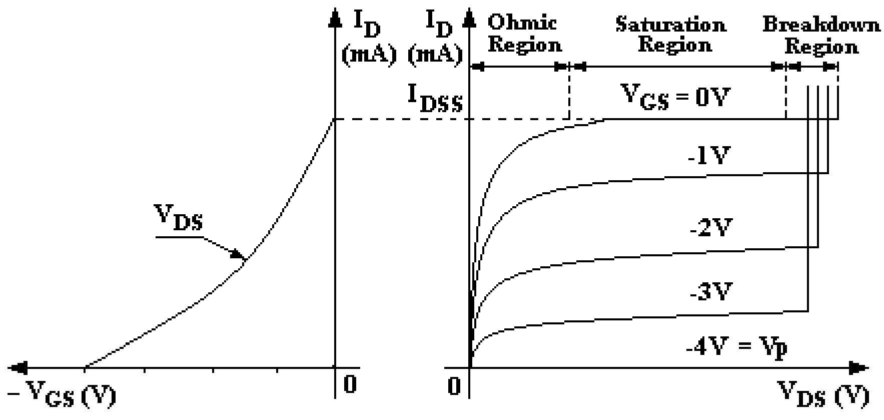
(COMMON SOURCE)

CIRCUIT DIAGRAM:



MODEL GRAPH:

FET Transfer Characteristics **FET Drain Characteristics**



JFET DRAIN & TRANSFER CHARACTERISTICS (CS)

Exp. No:……. **Date:………………**

AIM:

To conduct an experiment on a given JFET and obtain

1) Drain characteristics
2) Transfer Characteristics.
3) To find r_d, g_m, and μ from the characteristics.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Dual Regulated D.C Power supply	(0–30) Volts	1
2	JFET	BFW 10 or 11	1
3	D.C Ammeter	(0 – 20)mA	1
4	D.C Voltmeters	(0 – 2)V, (0 – 20)V	Each 1
5	Bread Board and connecting wires	--	1 Set

THEORY:

Introduction:

N-channel FET

The field effect transistor (FET) is made of a bar of N type material called the SUBSTRATE with a P type junction (the gate) diffused into it. With a positive voltage on the drain, with respect to the source, electron current flows from source to drain through the CHANNEL.

If the gate is made negative with respect to the source, an electrostatic field is created which squeezes the channel and reduces the current. If the gate voltage is high enough the channel will be "pinched off" and the current will be zero. The FET is voltage controlled, unlike the transistor which is current controlled. This device is sometimes called the junction FET or IGFET or JFET.

If the FET is accidentally forward biased, gate current will flow and the FET will be destroyed. To avoid this, an extremely thin insulating layer of silicon oxide is placed between the gate and the channel and the device is then known as an insulated gate FET, or IGFET or metal oxide semiconductor FET (MOSFET) Drain characteristics are obtained between the drain to source voltage (V_{DS}) and drain current (I_D) taking gate to source voltage (V_{GS}) as the parameter. Transfer characteristics are obtained between the gate to source voltage (V_{GS}) and Drain current (I_D) taking drain to source voltage (V_{DS}) as parameter

PROCEDURE:

DRAIN CHARACTERISTICS:

1. Connect the circuit as per the Fig. 1 and start with V_{GG} and V_{DD} keeping at zero volts.
2. Keep V_{GG} such that V_{GS} = 0 volts, Now vary V_{DD} such that V_{DS} Varies in steps of 1 volt up to 10 volts. And Note down the corresponding Drain current I_D
3. Repeat the above experiment with $V_{GS} =$ -1V and -2V and tabulate the readings.
4. Draw a graph V_{DS} Vs I_D against V_{GS} as parameter on graph.
5. From the above graph calculate r_d and note down the corresponding diode current against the voltage in the tabular form.
6. Draw the graph between voltage across the Diode Vs Current through the diode in the first quadrant as shown in fig.

TRANSFER CHARACTERISTICS:

1. Set V_{GG} and V_{DD} at zero volts .keep V_{DS} = 1Volt.
2. Vary V_{GG} such that V_{GS} varies in steps of 0.5 volts. Note down the corresponding Drain current $I_{D,}$ until $I_D =$ 0mA and Tabulate the readings.
3. Repeat the above experiment for V_{DS} = 3.0 Volts and 5.0 Volts and tabulate the readings.
4. Draw graph between V_{GS} Vs I_D with V_{DS} as parameter.
5. From the graph find g_m.
6. Now $\mu = g_m \times r_d$.

TABULAR FORM:

DRAIN CHARACTERISTICS:

S.No	V_{DS} (V)	V_{GS} = 0 volts I_D (mA)	V_{GS} = -1V I_D (mA)	V_{GS} = -2V I_D (mA)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

TRANSFER CHARACTERISTICS:

S.No	V_{GS} (V)	V_{DS} = 1.0V I_D (mA)	V_{DS} = 3.0V I_D (mA)	V_{DS} = 5.0V I_D (mA)
1				
2				
3				
4				
5				

CALCULATIONS:

CALCULATION OF r_d :

Construct a Triangle on one of the output characteristic for a particular V_{GS} in the active region and find ΔV_{DS} and ΔI_D

Now Drain resistance(r_d)= $\Delta V_{DS}/ \Delta I_D$ (V_{GS} = constant)

CALCULATION OF g_m :

Construct a Triangle on one of the Transfer characteristics for a particular V_{DS} find ΔV_{GS} and ΔI_D.

Now trans conductance(g_m) = $\Delta I_D/\Delta V_{GS}$ (V_{DS} = constant).

CALCULATION OF μ :

Amplification Factor (**μ**) = g_m x r_d.

PRECAUTIONS:

1. check the wires for continuity before use.
2. keep the power supply at zero volts before starting the experiment.
3. All the contacts must be intact.
4. For a good JFET I_D will be ≥ 11.0 mA at V_{GS} = 0.0 volts if not change the JFET.

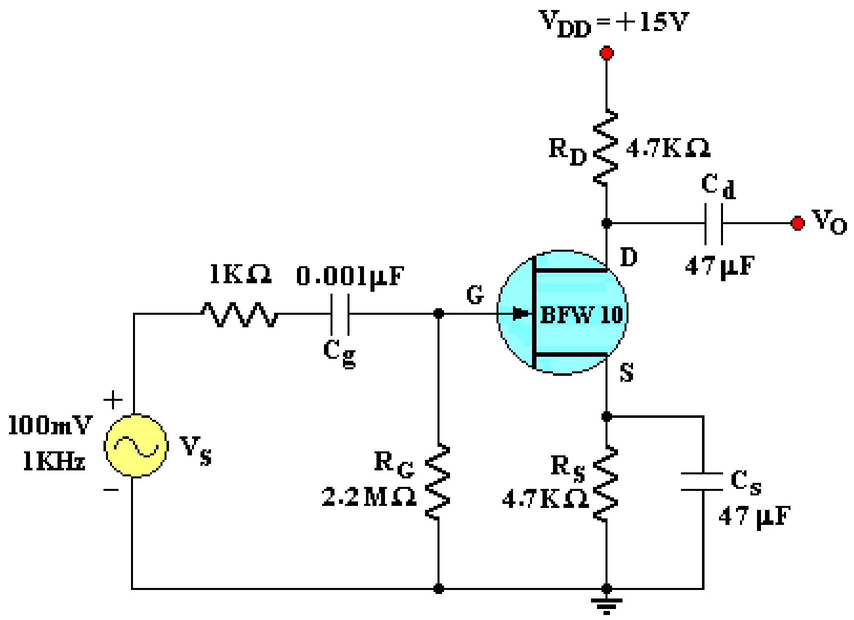
RESULT:

VIVA QUESTIONS:

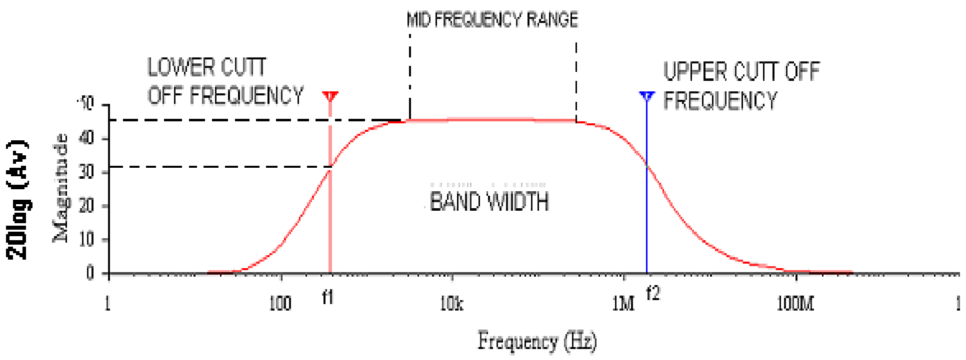
1. What are the advantages of JFET over BJT?
2. Why input resistance in FET amplifier is more than BJT amplifier
3. What is a Uni polar Device?
4. What is Pinch off Voltage?
5. What are the various FETs?
6. What is Enhancement mode and depletion mode?
7. Draw the equivalent circuit of JFET for Low frequencies
8. Write the mathematical equation for g_m in terms of g_{mo}.
9. Write equation of FET I_D in terms of V_{GS} and V_P.
10. What is the effect of Gate to source voltage on Drain characteristics?

JFET AMPLIFIER (COMMON SOURCE)

CIRCUIT DIAGRAM:



MODEL GRAPH:



COMMON SOURCE JFET AMPLIFIER

Exp. No:……. **Date:………………**

AIM: To study the frequency response of a Common Source Field Effect Transistor and to find the Bandwidth from the Response.

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Regulated D.C Power supply	0–30 Volts	1
2	JFET	BFW10 or 11	1
3	Signal Generator	(0 – 1MHz)	1
4	Resistors	1KΩ, 2.2MΩ, 4.7KΩ, 470Ω	Each 1
5	Capacitors	47μf	2
6	Capacitors	0.001μf	1
7	Bread Board and connecting wires	-	1 Set
8	Dual Trace CRO	20MHz	1 No

THEORY:

In Common Source Amplifier Circuit Source terminal is common to both the input and output terminals. In this Circuit input is applied between Gate and Source and the output is taken from Drain and the source. JFET amplifiers provide an excellent voltage gain with the added advantage of high input impedance and other characteristics JFETs are often preferred over BJTs for certain types of applications. The CS amplifier of JFET is analogous to CE amplifier of BJT.

A common-source amplifier is one of three basic single-stage field-effect transistor (FET) amplifier topologies, typically used as a voltage or transconductance amplifier. The easiest way to tell if a FET is common source, common drain, or common gate is to examine where the signal enters and leaves. The remaining terminal is what is known as "common". In this example, the signal enters the gate, and exits the drain. The only terminal remaining is the source. This is a common-source FET circuit. The analogous bipolar junction transistor circuit is may be viewed as a transconductance amplifier or as a voltage amplifier. (See classification of amplifiers). As a transconductance amplifier, the input voltage is seen as modulating the current going to the load. As a voltage amplifier, input voltage modulates the amount of current flowing through the FET, changing the voltage across the output resistance according to Ohm's law.

However, the FET device's output resistance typically is not high enough for a reasonable transconductance amplifier (ideally infinite), nor low enough for a decent voltage amplifier (ideally zero). Another major drawback is the amplifier's limited high-frequency response. Therefore, in practice the output often is routed through either a voltage follower (common-drain or CD stage), or a current follower (common-gate or CG stage), to obtain more favorable output and frequency characteristics. The CS–CG combination is called a cascade amplifier

PROCEDURE:

1. Connect the circuit as per the Fig.
2. Keep I/P Voltage at 100mV.
3. Vary the frequency from 50 Hz to 1MHz in appropriate steps and note down the corresponding source voltage Vs and o/p Voltage Vo in a tabular Form .
4. Plot the frequency (f) Vs Gain (Av) on a semi-log graph sheet and determine the Bandwidth. From the graph.

TABULAR FORM:

I/P Voltage, V_s = 100mV

S.No	Frequency (Hz)	O/P Voltage, Vo (V)	Voltage Gain Av =Vo/Vi	Av in dB = 20 log (Av)
1	50			
2	100			
3	200			
4	300			
5	500			
6	700			
7	1K			
8	3K			
9	5K			
10	7K			
11	10K			

12	30K			
13	50K			
14	70K			
15	100K			
16	300K			
17	500K			
18	700K			
19	1M			

PRECAUTIONS:

1. Check the wires for continuity before use.
2. Keep the power supply at Zero volts before Start
3. All the contacts must be intact
4. For a good JFET I_D will be ≥ 11.0 mA at V_{GS} = 0.0 Volts if not change the JFET.

RESULT:

VIVA QUESTIONS:

1. What are the advantages of JFET over BJT?
2. Why input resistance in FET amplifier is more than BJT amplifier
3. What is a Uni-polar Device?
4. What is Pinch off Voltage?
5. What are the various FETs?
6. What is Enhancement mode and depletion mode?
7. Draw the equivalent circuit of JFET for Low frequencies
8. Write the mathematical equation for g_m in terms of g_{mo}.
9. Write equation of FET I_D in terms of V_{GS} and V_P.
10. Why JFET is also called square law device?

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