ELECTRONIC DEVICES CIRCUITS (EDC)
LABORATORY MANUAL

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

DEPT. OF ELECTRONICS AND COMMUNICATION ENGINEERING

SIR C.R.REDDY COLLEGE OF ENGINEERING

ELURU – 534 007

ELECTRONIC DEVICES CIRCUITS (EDC) - LAB

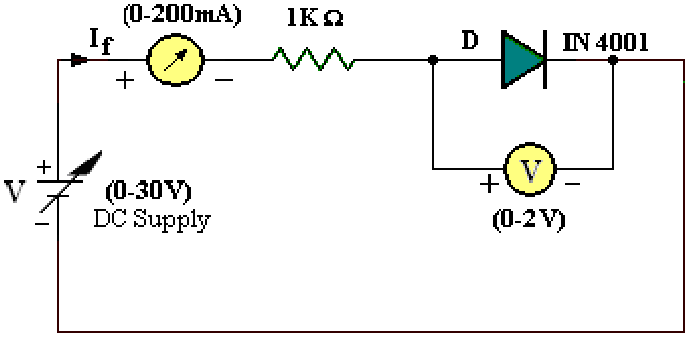
FOR II / IV B.E (ECE), I - SEMESTER

LIST OF EXPERIMENTS

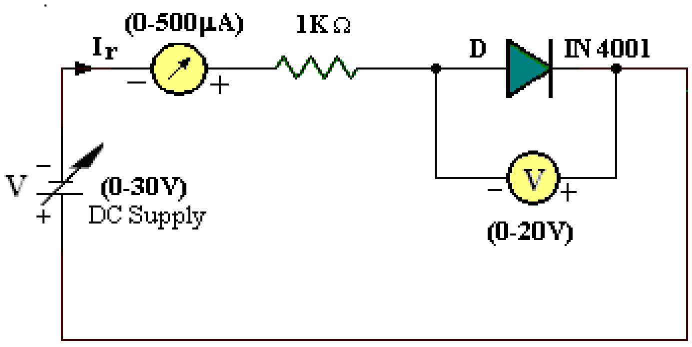
1. CHARACTERISTICS OF PN JUNCTION DIODE
2. CHARACTERISTICS OF ZENER DIODE
3. HALF-WAVE & FULL-WAVE RECTIFIERS
4. BRIDGE RECTIFIER
5. CB TRANSISTOR CHARACTERISTICS
6. CE TRANSISTOR CHARACTERISTICS
7. DESIGN SELF BIAS CIRCUIT
8. CE TRANSISTOR AMPLIFIER
9. JFET DRAIN & TRANSFER CHARACTERISTICS (CS)
10. JFET AMPLIFIER (COMMON SOURCE)
11. TRANSISTOR AS A SWITCH
12. CHARACTERISTICS OF UJT
13. CC TRANSISTOR AMPLIFIER

CHARACTERISTICS OF PN JUNCTION DIODE

CIRCUIT DIAGRAMS:

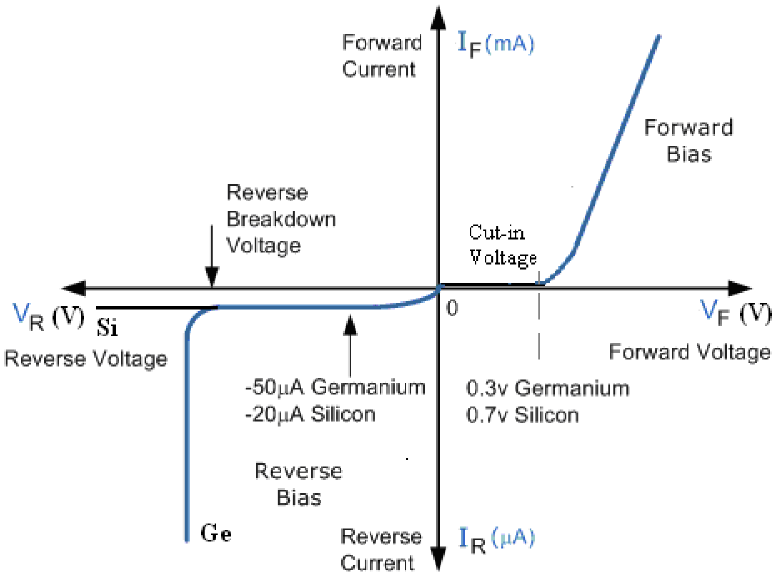


Forward Bias Characteristics



Reverse Bias Characteristics

MODEL GRAPH:



V-I Characteristics of PN Junction Diode

CHARACTERISTICS OF PN JUNCTION DIODE

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, Dynamic Resistance for Forward Bias & Reverse Bias

APPARATUS:

S.No	Name	Range / Value	Quantity
1	DC Regulated Power Supply	0 – 30 volts	1
2	Diode	1N 4001	1
3	Diode	OA 82	1
4	Resistor	1KΩ	1
5	D.C Ammeters	0–100mA, 0–500µA	Each 1
6	D.C Volt meters	0–2V, 0–20V	Each 1
7	Bread Board and connecting wires	-	1 Set

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 30mA.
4. Repeat the same by using Ge Diode instead of Si Diode.
5. Plot the graph V_F versus I_F on the graph Sheet in the 1st quadrant as in Fig.
6. From the graph find out the Static & Dynamic forward Bias resistance of the diode
$$R = \frac{V_F}{I_F}, \qquad r_{ac} = \frac{\Delta V_F}{\Delta I_F}.$$
7. 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 30.0V.
4. Repeat the same by using Ge Diode instead of Si Diode.
5. Plot the graph V_R versus I_R on the graph Sheet in the 3rd quadrant as in Fig.
6. From the graph find out the Dynamic Reverse Bias resistance of the diode.
$$R = \frac{V_R}{I_R}, \qquad r_{ac} = \frac{\Delta V_R}{\Delta I_R}.$$
7. Observe and note down the break down Voltage of the diode.

TABULAR FORMS:

FORWARD BIAS:

S.No	Voltmeter Reading V_F(Volts)	Ammeter Reading I_F (mA)
1		0.0
2		0.2
3		0.6
4		2
5		4
6		6
7		8
8		10
9		14
10		18
11		20

REVERSE BIAS:

Voltmeter Reading V_R (Volts)	Ammeter Reading I_R (μA)
0	
2	
4	
6	
8	
10	
12	
14	
16	
18	
20	

RESULT :

The V-I Characteristics of the PN Junction Diode are plotted for the both Forward and Reverse Bias conditions and Calculated the Cut in Voltage, Dynamic Forward and Reverse Bias resistance.

Specifications		Si	Ge
Cut in Voltage			
Static Resistance	F. Bias		
	R. Bias		
Dynamic Resistance	F. Bias		
	R. Bias		

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.

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. What are Static and Dynamic Resistances?
6. Explain the working of a Diode as a switch
7. What is space charge?
8. What is Diffusion Capacitance?
9. What are Minority and Majority carriers in P type and in N type materials?
10. What are the specifications of a Diode?
11. What is PIV?
12. Why leakage current is more for Ge Diode?
13. What is work function?
14. What is the current equation of the Diode?

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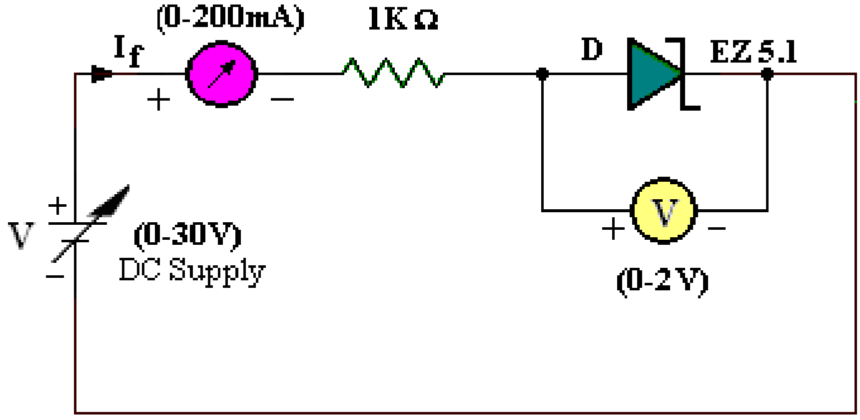
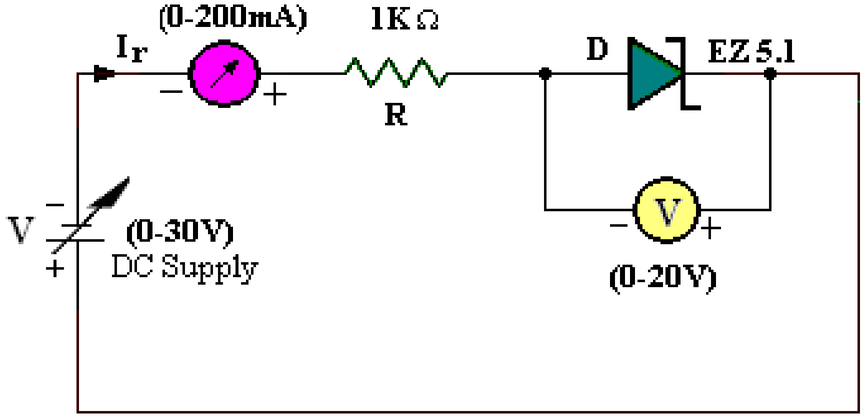
CHARACTERISTICS OF ZENER DIODE

CIRCUIT DIAGRAMS:

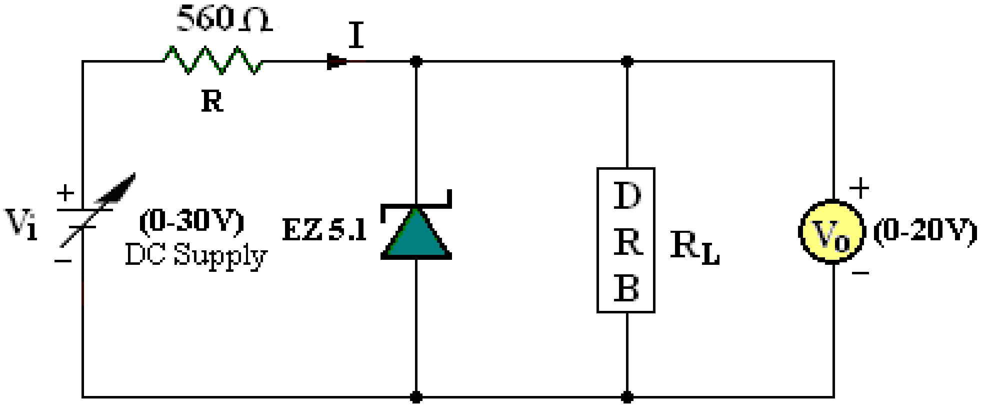


Forward Bias Characteristics



Reverse Bias Characteristics

VOLTAGE REGULATION:



Zener Diode Voltage Regulation

CHARACTERISTICS OF ZENER DIODE & LOAD REGULATION

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.
iii) To Obtain the Load Regulation 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, 560Ω	Each 1
4	D.C Ammeters	0–200mA	1
5	D.C Volt meters	0–2V, 0–20V	Each 1
6	Decade Resistance Box	-	1
7	Bread Board and connecting wires	-	1 Set

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 Zener 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 in the 1st quadrant as in Fig.
5. From the graph find out the Static & Dynamic forward Bias resistance of the diode

$$R = \frac{V_F}{I_F}, \qquad r_{ac} = \frac{\Delta V_F}{\Delta I_F}.$$

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 Current in steps of 2mA and note down the corresponding voltage across the Zener Diode under Reverse Bias condition as per table given below.
3. Take the readings until a Diode Current of 20mA.
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.

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

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

LOAD REGULATION CHARACTERISTICS:

1. Connect the Circuit as per the Circuit Diagram on the bread board.
2. By changing the load Resistance, kept constant I/P Voltage at 5V, 10 V, 15 V as per table given below. Take the readings of O/P Voltmeter (Vo=Vz).
3. Now by changing the I/P Voltage, kept constant load Resistance at 1K, 2K, 3K as per table given below. Take the readings of O/P Voltmeter (Vo=Vz).

TABULAR FORMS:

FORWARD BIAS:

S.No	Voltmeter Reading V_F(Volts)	Ammeter Reading I_F (mA)
1		0.0
2		0.2
3		0.4
4		0.6
5		0.8
6		2
7		4
8		6
9		8
10		10
11		12
12		16
13		18
14		20

REVERSE BIAS:

Voltmeter Reading V_R (Volts)	Ammeter Reading I_R (mA)
	0.0
	0.2
	0.4
	0.6
	0.8
	2
	4
	6
	8
	10
	12
	16
	18
	20

LOAD REGULATION:

S.No	R_L (Ω)	V_{i1}= 5V V_O (V)	V_{i2}= 10V V_O (V)	V_{i3}=15V V_O (V)
1	100			
2	300			
3	500			
4	700			
5	900			
6	1K			
7	3K			
8	5K			
9	7K			
10	10K			

Vi (V)	R_{L1}=1KΩ V_O (V)	R_{L2}=2KΩ V_O (V)	R_{L3}=3KΩ V_O (V)
0			
1			
3			
5			
7			
9			
11			
13			
15			
20			

ZENER BREAKDOWN VOLTAGE:

Draw a tangent on the reverse Bias Characteristic of the Zener Diode starting from the Knee and touching most of the points of the curve. The point where the tangent intersects the X-axis is the Zener Breakdown Voltage.

RESULT:

The Characteristics of the Forward and Reverse biased Zener Diode and the Zener Break Down Voltage from the Characteristics are Observed.

Zener Breakdown Voltage = Volts.

Forward Bias Resistance = Ohms

Reverse Bias Resistance = Ohms

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

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 break downs?
4. What is the difference between Avalanche Zener break down?
5. In a lightly doped and heavily doped diode which type of break down occurs?
6. Why Zener break down and Avalanche BD 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 Jn diode and Zener diode?

10 What is a Regulation?

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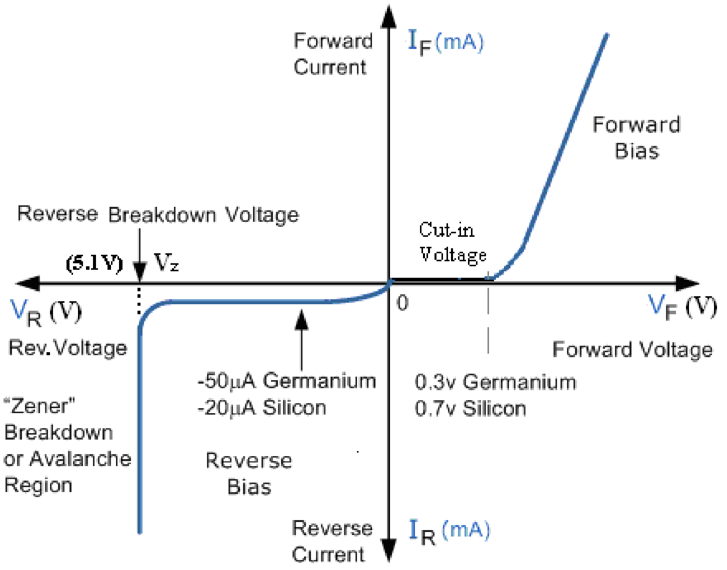
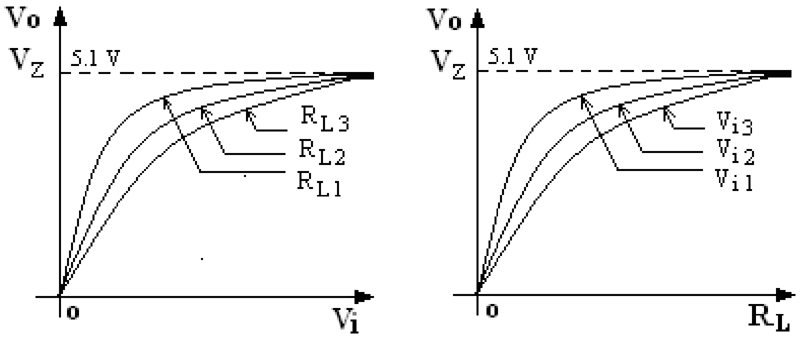
MODEL GRAPHS:

ZENER DIODE CHARACTERISTICS:



V-I Characteristics of Zener Diode

LOAD REGULATION CHARACTERISTICS:

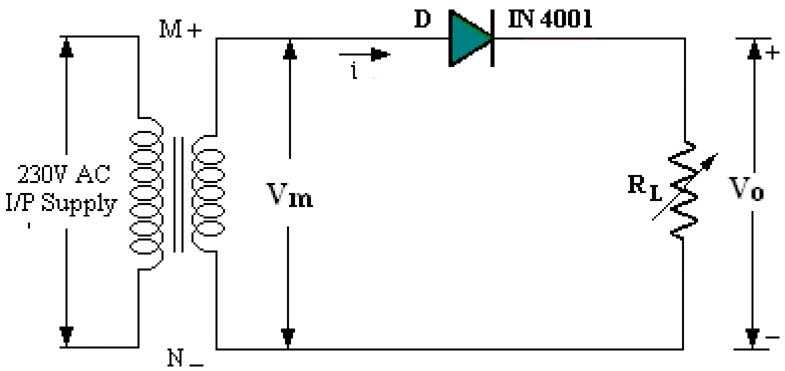


Voltage Rgulation Charastics Vi vs Vo and R_L vs Vo

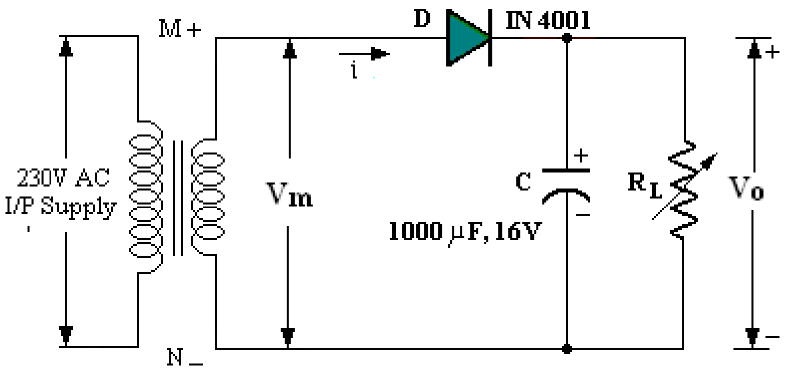
HALF-WAVE RECTIFIERS

CIRCUIT DIAGRAMS:

WITHOUT CAPACITOR FILTER AND WITH CAPACITOR FILTER:

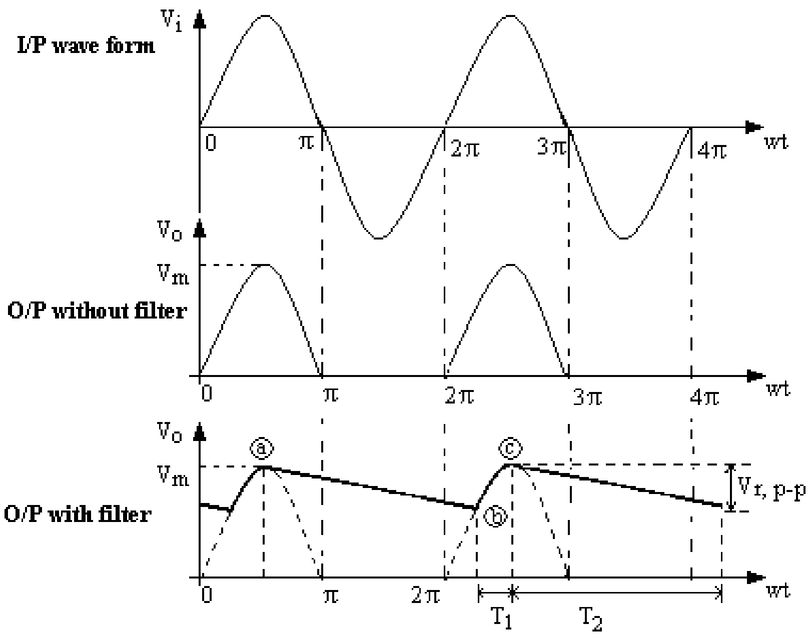


Half-wave Rectifier without filter



Half-wave Rectifier with capacitor filter

WAVE SHAPES:



Half-wave Rectifier with capacitor filter wave form

HALF-WAVE RECTIFIER

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 / 0 - 9V	1
2	Diode	1N4001	1
3	Capacitors	1000µF/16V, 470µf/25V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1 Set
7	Dual Trace CRO	20MHz	1

PROCEDURE:

WITHOUT FILTER:

1. Connecting the circuit on bread board as per the circuit diagram
2. Connect the primary of the transformer to main supply i.e. 230V, 50Hz
3. Connect the decade resistance box and set the R_L value to 100Ω
4. Connect the Multimeter at output terminals and vary the load resistance (DRB) from 100Ω to 1KΩ and note down the Vac and Vdc as per given tabular form
5. Disconnect load resistance (DRB) and note down no load voltage Vdc ($V_{no\ load}$)
6. Connect load resistance at 1KΩ and connect Channel – II of CRO at output terminals and CH – I of CRO at Secondary Input terminals observe and note down the Input and Output Wave form on Graph Sheet.
7. Calculate ripple factor $\gamma = \frac{V_{ac}}{V_{dc}}$
8. Calculate Percentage of Regulation, $\%\eta = \frac{V_{\text{no load}} - V_{\text{full load}}}{V_{\text{no load}}} * 100\%$

WITH CAPACITOR FILTER:

1. Connecting the circuit as per the circuit Diagram and repeat the above procedure from steps 2 to 8.

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) = V

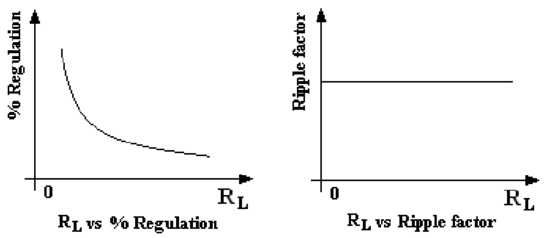
S.No	Load Resistance	O/P Voltage (Vo)		Ripple factor	% of Regulation
	R_L (Ω)	V_{ac} (V)	V_{dc} (V)	$\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	$\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH CAPACITOR FILTER:

V no load Voltage (Vdc) = V

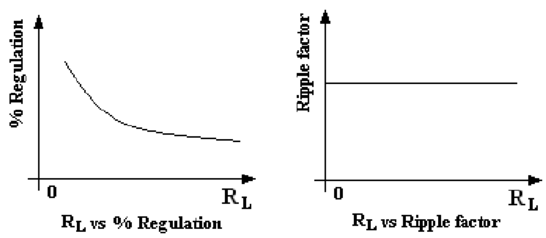
S.No	Load Resistance	O/P Voltage (Vo)		Ripple factor	% of Regulation
	R_L (Ω)	V_{ac} (V)	V_{dc} (V)	$\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	$\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

MODEL GRAPHS:



R_L vs % Regulation R_L vs Ripple factor

Without filter wave form



R_L vs % Regulation R_L vs Ripple factor

With filter wave form

RESULT: Observe Input and Output Wave forms and Calculate ripple factor and percentage of regulation in Half wave rectifier with and without filter.

Without Filter:

Ripple Factor :
Regulation :

With Capacitor Filter:

Ripple Factor :
Regulation :

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.

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?
6. What is meant by time constant?
8. What happens to the o/p wave form if we increase the capacitor value?
9. What happens if we increase the capacitor value?

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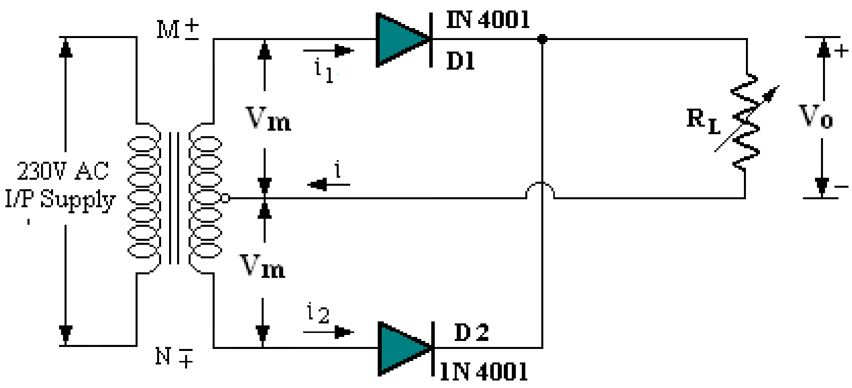
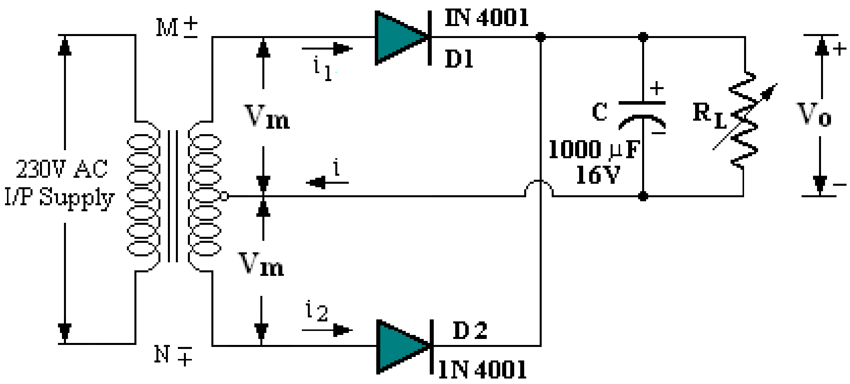
FULL-WAVE RECTIFIERS

CIRCUIT DIAGRAMS:
WITHOUT FILTER AND **WITH FILTER:**

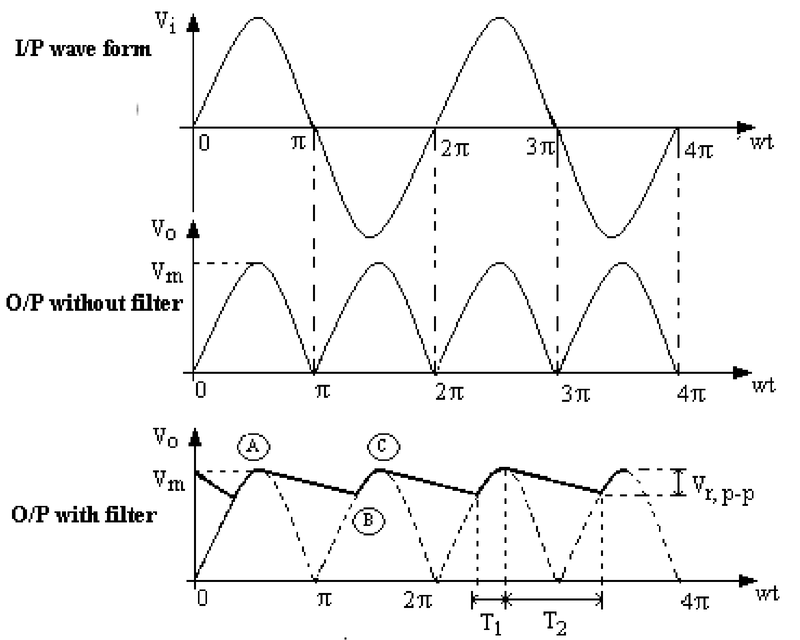


Full-wave Rectifier without filter



Full-wave Rectifier with capacitor filter

WAVE SHAPES:



Full-wave Rectifier with capacitor filter wave form

FULL-WAVE RECTIFIERS

AIM: To Rectify the AC signal and then to find out Ripple factor and percentage of Regulation in Full-wave rectifier center tapped circuit 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, 470μf/25V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1
7	Dual Trace CRO	20MHz	1

PROCEDURE:

WITHOUT FILTER:

1. Connecting the circuit on bread board as per the circuit diagram.
2. Connect the primary of the transformer to main supply i.e. 230V, 50Hz
3. Connect the decade resistance box and set the R_L value to 100Ω
4. Connect the Multimeter at output terminals and vary the load resistance (DRB) from 100Ω to 1KΩ and note down the Vac and Vdc as per given tabular form
5. Disconnect load resistance (DRB) and note down no load voltage Vdc ($V_{\text{no load}}$)
6. Connect load resistance at 1KΩ and connect Channel – II of CRO at output terminals and CH – I of CRO at Secondary Input terminals observe and note down the Input and Output Wave form on Graph Sheet.
7. Calculate ripple factor $\gamma = \dfrac{V_{ac}}{V_{dc}}$
8. Calculate Percentage of Regulation, $\%\eta = \dfrac{V_{\text{no load}} - V_{\text{full load}}}{V_{\text{no load}}} * 100\%$

WITH CAPACITOR FILTER:

1. Connecting the circuit as per the circuit Diagram and repeat the above procedure from steps 2 to 8.

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) = V

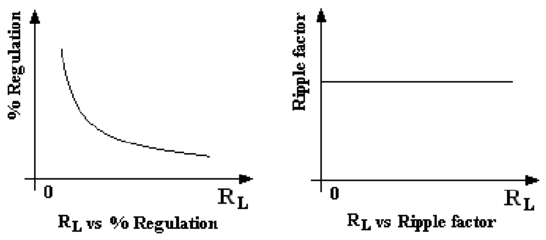
S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo) V_{ac} (V)	V_{dc} (V)	Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH CAPACITOR FILTER:

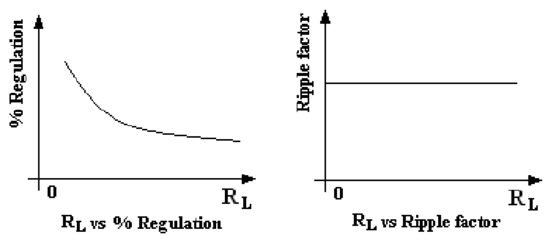
V no load Voltage (Vdc) = V

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

MODEL GRAPHS:



Without filter wave form



With filter wave form

RESULT: Observe Input and Output Wave forms and Calculate ripple factor and percentage of regulation in Full-wave rectifier with and without filter.

Without Filter:

Ripple Factor :
Regulation :

With Capacitor Filter:

Ripple Factor :
Regulation :

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.

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?

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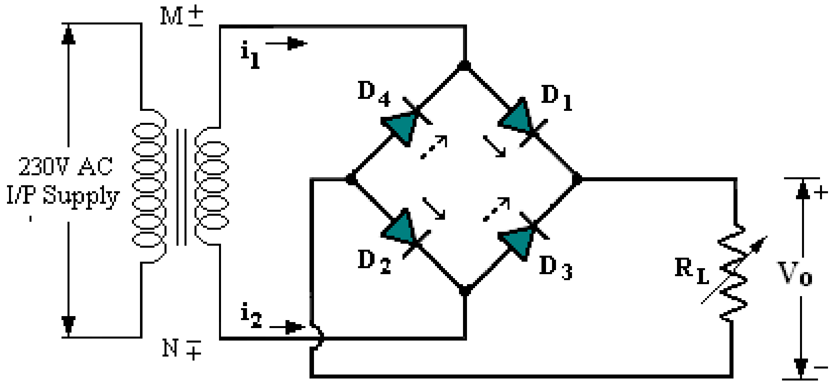
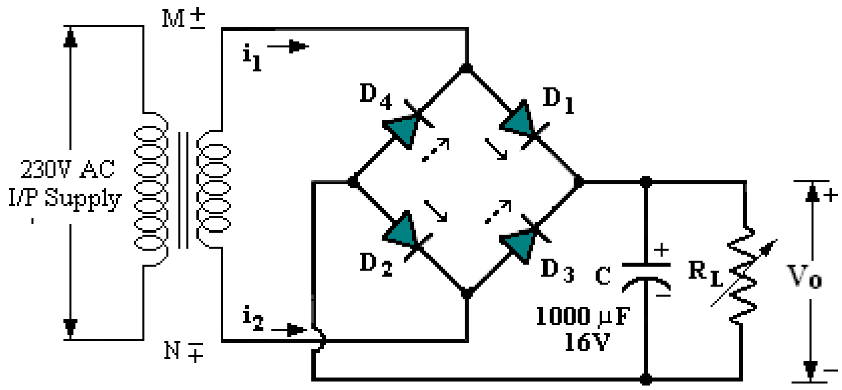
BRIDGE RECTIFIER

CIRCUIT DIAGRAMS:

WITH OUT FILTER & WITH FILTER:

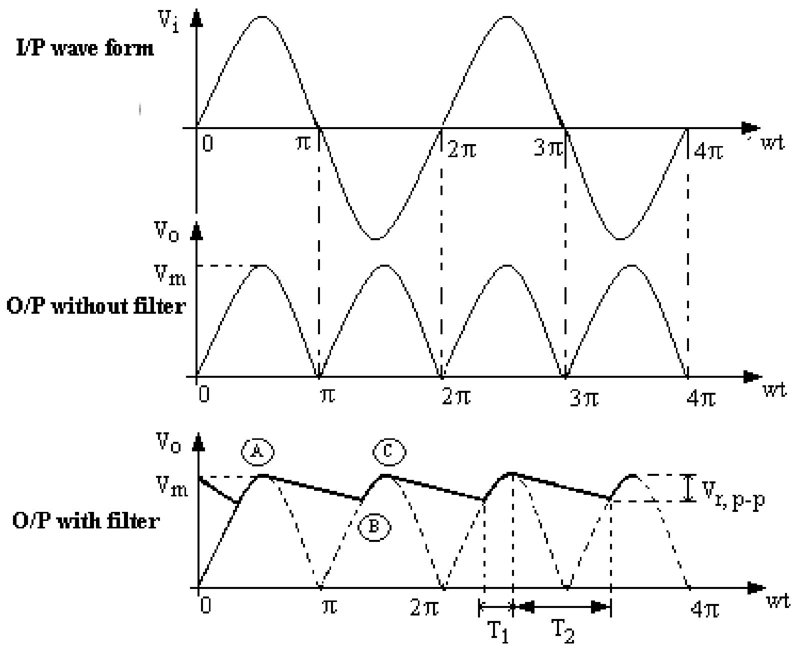


Bridge Rectifier without filter



Bridge Rectifier with capacitor filter

WAVE SHAPES:



Bridge Rectifier with capacitor filter wave form

BRIDGE RECTIFIERS

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, 470μf/25V	1
4	Decade Resistance Box	-	1
5	Multimeter	-	1
6	Bread Board and connecting wires	-	1
7	Dual Trace CRO	20MHz	1

PROCEDURE:

WITHOUT FILTER:

1. Connecting the circuit on bread board as per the circuit diagram.
2. Connect the primary of the transformer to main supply i.e. 230V, 50Hz
3. Connect the decade resistance box and set the R_L value to 100Ω
4. Connect the Multimeter at output terminals and vary the load resistance (DRB) from 100Ω to 1KΩ and note down the Vac and Vdc as per given tabular form
5. Disconnect load resistance (DRB) and note down no load voltage Vdc ($V_{\text{no load}}$)
6. Connect load resistance at 1KΩ and connect Channel – II of CRO at output terminals and CH – I of CRO at Secondary Input terminals observe and note down the Input and Output Wave form on Graph Sheet.
7. Calculate ripple factor $\gamma = \frac{V_{ac}}{V_{dc}}$
8. Calculate Percentage of Regulation, $\%\eta = \frac{V_{\text{no load}} - V_{\text{full load}}}{V_{\text{no load}}} * 100\%$

WITH CAPACITOR FILTER:

1. Connecting the circuit as per the circuit Diagram and repeat the above procedure from steps 2 to 8.

TABULAR FORMS:

WITHOUT FILTER:

V no load Voltage (Vdc) = V

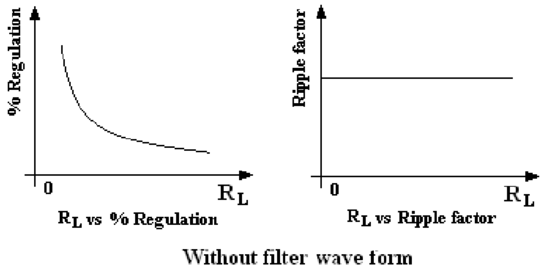
S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$
		V_{ac} (V)	V_{dc} (V)		
1	100				
2	200				
3	300				
4	400				
5	500				
6	600				
7	700				
8	800				
9	900				
10	1K				

WITH CAPACITOR FILTER:

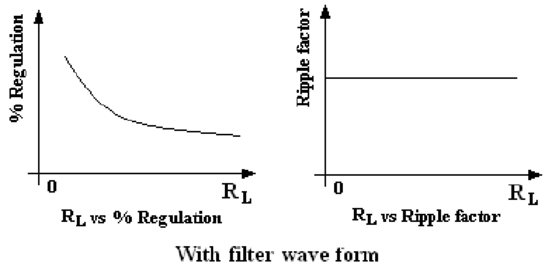
V no load Voltage (Vdc) = V

S.No	Load Resistance R_L (Ω)	O/P Voltage (Vo)		Ripple factor $\left(\gamma = \frac{V_{ac}}{V_{dc}}\right)$	% of Regulation $\left(\frac{V_{NL} - V_{FL}}{V_{NL}} * 100\%\right)$
		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				

MODEL GRAPHS:



Without filter wave form



With filter wave form

RESULT: Observe Input and Output Wave forms and Calculate ripple factor and percentage of regulation in Full-wave Bridge rectifier with and without filter.

Without Filter:

Ripple Factor :
Regulation :

With Capacitor Filter:

Ripple Factor :
Regulation :

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.

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?

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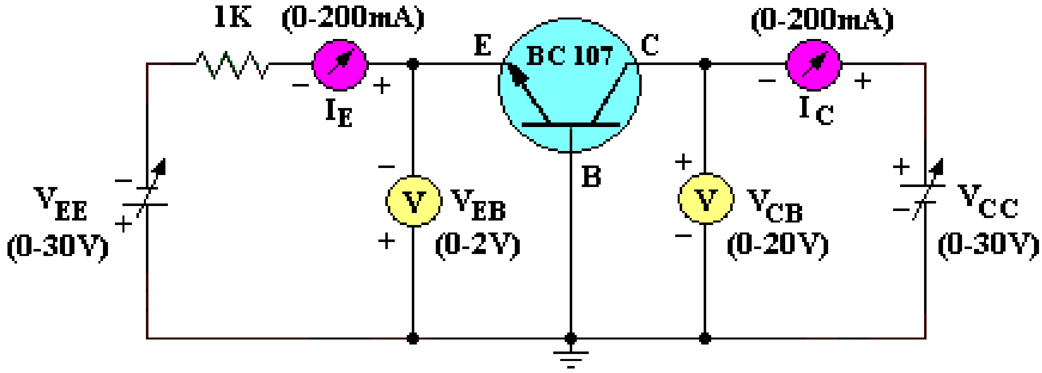
CB TRANSISTOR CHARACTERISTICS

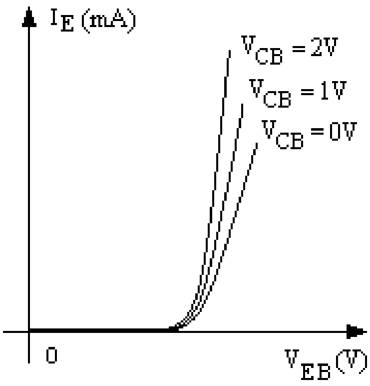
CIRCUIT DIAGRAMS:



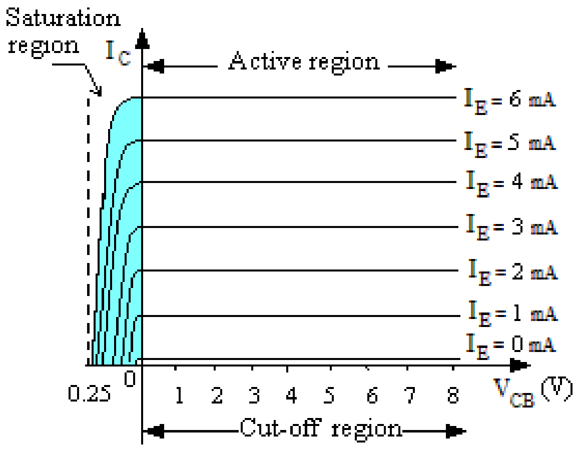
Common Base Transistor Characteristics

MODEL GRAPHS;

1. Plot the Input characteristics by taking I_E on y–axis and V_{EB} on x–axis.
2. Plot the Output characteristics by taking I_C on y–axis and V_{CB} on x–axis.



CB I/P Characteristics



CB O/P Characteristics

COMMON BASE TRANSISTOR CHARACTERISTICS

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	(0-200mA)	2
5	DC Voltmeters	(0-2V), (0-20V)	Each 1 No
6	Bread Board and connecting wires	-	1 Set

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} Vs 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.

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		0.0		0.0		0.0
2		0.2		0.2		0.2
3		0.4		0.4		0.4
4		0.6		0.6		0.6
5		0.8		0.8		0.8
6		1.0		1.0		1.0
7		4.0		4.0		4.0
8		8.0		8.0		8.0
9		10.0		10.0		10.0
10		14.0		14.0		14.0
11		18.0		18.0		18.0
12		20.0		20.0		20.0

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	0.0			0.0		0.0
2	0.2			0.2		0.2
3	0.4			0.4		0.4
4	0.6			0.6		0.6
5	0.8			0.8		0.8
6	1.0			1.0		1.0
7	3.0			3.0		3.0
8	5.0			5.0		5.0
9	7.0			7.0		7.0
10	10.0			10.0		10.0
11	12.0			12.0		12.0
12	15.0			15.0		15.0

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}) .

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

RESULTS:

The Input and Output characteristics are drawn on the graphs and the h parameters are calculated .

h_{ib}= --------- ohms. h_{rb}= -----------

h_{ob}= -------- mhos. h_{fb} = -----------

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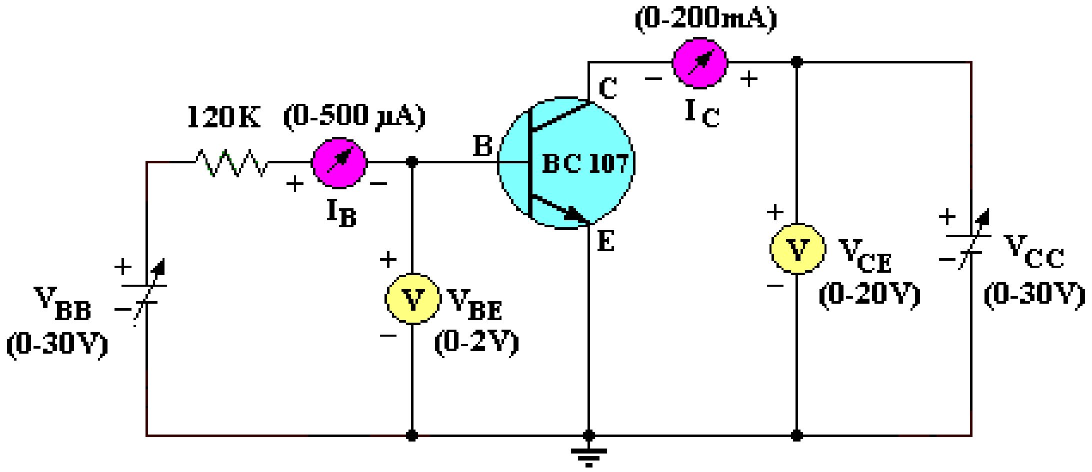
CE TRANSISTOR CHARACTERISTICS

CIRCUIT DIAGRAMS:



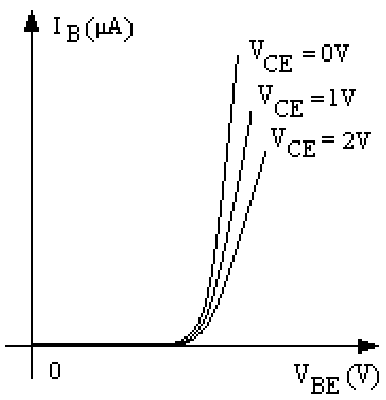
Common Emitter Transistor Characteristics

MODEL GRAPHS:

1. Plot the Input characteristics by taking I_B on y-axis and V_{BE} on x-axis.

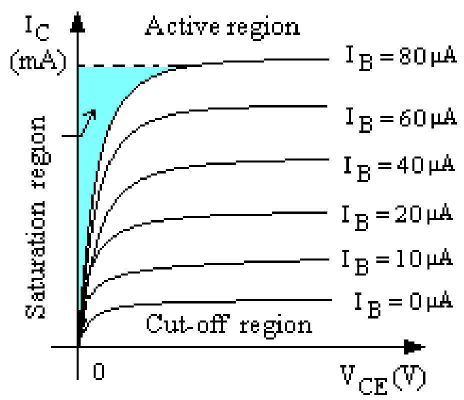
2. Plot the Output characteristics by taking I_C on the y-axis and V_{CE} on x-axis.

INPUT CHARACTERISTICS:



CE I/P Characteristics

OUTPUT CHARACTERISTICS:



CE O/P Characteristics

COMMON EMITTER TRANSISTOR CHARACTERISTICS

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	(0-500µA), (0-200mA)	Each 1 No
5	DC Voltmeters	(0-2V), (0-20V)	Each 1 No
6	Bread Board and connecting wires	-	1 Set

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 V_{CE} = 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		0		0		0
2		5		5		5
3		10		10		10
4		20		20		20
5		40		40		40
6		60		60		60
7		80		80		80
8		100		100		100
9		120		120		120
10		140		140		140
11		180		180		180
12		200		200		200

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	0.0		0.0		0.0	
2	0.2		0.2		0.2	
3	0.4		0.4		0.4	
4	0.6		0.6		0.6	
5	0.8		0.8		0.8	
6	1.0		1.0		1.0	
7	3.0		3.0		3.0	
8	5.0		5.0		5.0	
9	7.0		7.0		7.0	
10	10.0		10.0		10.0	

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}

$$h_{rb} = \frac{V_{BE2} - V_{BE1}}{V_{CB2} - V_{CB1}};$$

Calculation of h_{fe}:

Draw a vertical line on the out put characteristics at some constant V_{CE} value. Find I_{c2}, I_{c1} 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:

The input and out put characteristics are drawn on the graphs and the h parameters are calculated .

h_{ie}= --------- ohms. h_{re}= -----------

h_{oe}= -------- mhos. h_{fe} = -----------

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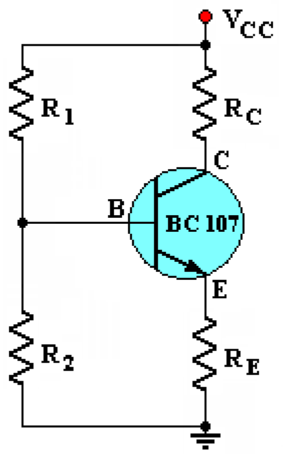
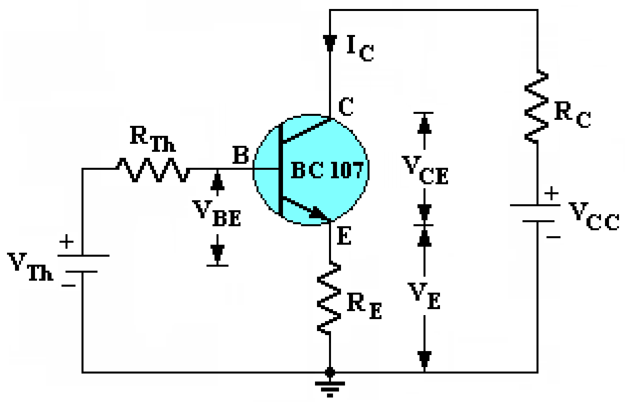
DESIGN SELF BIAS CIRCUIT

CIRCUIT DIAGRAMS:



Self Bias circuit



Self Bias equivalent circuit

DESIGN PROCEDURE:

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

Find hfe of the transistor

S= (1+β) / (1+βRe / (Re + Rb))

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

$R_B = R_1R_2 / (R_1+R_2)$

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

$V_{CC} = I_CR_C + V_{CE} + (1+\beta)I_BR_E$

Using the above formula find Re, R1, R2.

TABULAR FORM:

Parameter	Theoretical Values	Practical ValuesName
I_C		
V_{CE}		
R_1		
R_2		
R_E		
R_B		

DESIGN SELF BIAS CIRCUIT

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 Volts	1
2	Transistor	BC107	1
3	Capacitors	50μf	2
4	Capacitors	10μf	1
5	Multimeter	-	1
6	Signal Generator	(0 – 1MHz)	1
7	Bread Board and connecting wires	-	1 Set
8	Dual Trace CRO	20MHz	1

PROCEDURE:
1. Connect the circuit as per the circuit diagram. Apply Vcc of 12 Volts DC.
2. Find the resulting DC Values of Icq and Vceq.
3. Apply a 1KHz signal from the Signal Generator and observe the O/P on CRO.
4. Increase the I/P voltage slowly until the output waveform starts distortion
5. Note down the input voltage Vi at the point where the output starts distortion
6. This input value is known as maximum signal handling capability.
7. Calculate the gain of the amplifier.

RESULT:
The maximum signal Handling capability of the amplifier = Volts
Gain of the amplifier =

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

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?
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?

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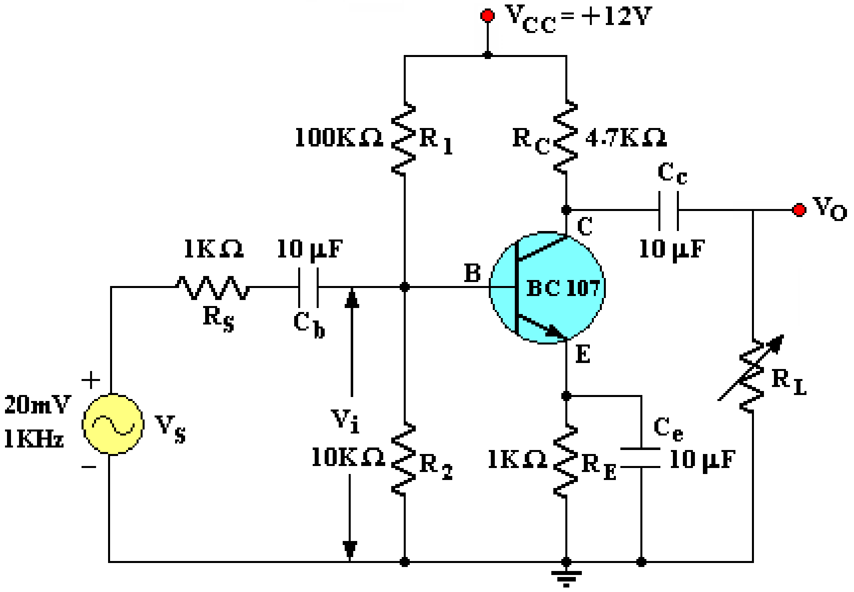
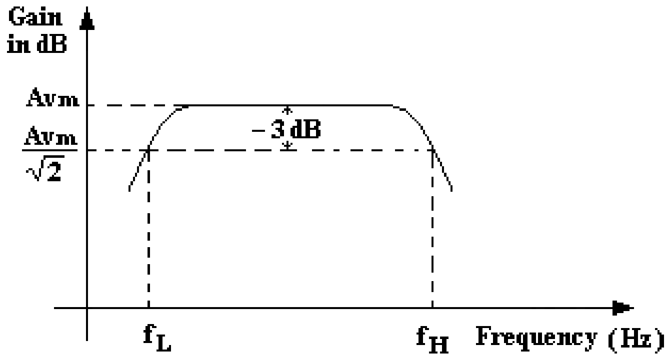
CE TRANSISTOR AMPLIFIER

CIRCUIT DIAGRAMS:



Common Emitter Transistor Amplifier

MODEL GRAPH:



CE TRANSISTOR AMPLIFIER

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 – 1MHz)	1
8	Dual Trace CRO	20MHz	1
9	Bread Board and connecting wires	--	1 Set

PROCEDURE:

1. Connect the circuit as per the Fig.1.,Apply Vcc of 12 Volts DC.
2. Apply I/P Voltage of 20mV at 1KHz 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 Vo in a tabular form .
4. Calculate the Voltage Gain Av = Vo/Vs and note down in the tabular form.
5. Plot the frequency (f) Vs Gain (Av) on a Semi-log Graph sheet
6. Draw a horizontal line at 0.707 times Av and note down the cut off points and the Bandwidth is given by B.W $= f_2 – f_1$.

INPUT RESISTANCE RI:

1. Apply I/P Voltage of 20mV at 1KHz from the Signal Generator and observe voltage Vi across R2 on CRO.
2. Without Disturbing the setup note Vi.
3. find Ii = (Vs – Vi) / Rs and Ri= Vi / Ii Ohms.

OUTPUT RESISTANCE (R_O):

1. Apply I/P Voltage of 50mV at 1KHz from the Signal Generator and observe the o/p on CRO
2. Connect a Potentio meter across the O/P terminals and without disturbing Vs adjust the potentiometer such that o/p falls to $V_0/2$
3. The Resistance of the potentiometer is equal to Ro.

TABULAR FORMS:

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			

RESULT:

BandWidth	B.W	$= f_2 - f_1 =$	Hz
Voltage Gain	Av	=	
Input Resistance	Ri	=	ohms
Output Resistance	Ro	=	ohms

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

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?

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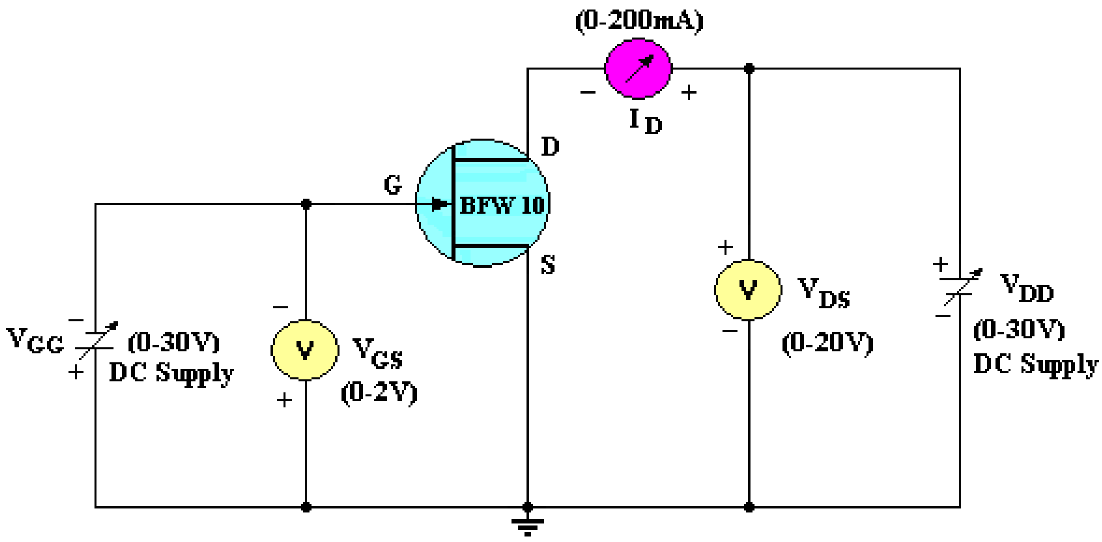
JFET DRAIN & TRANSFER

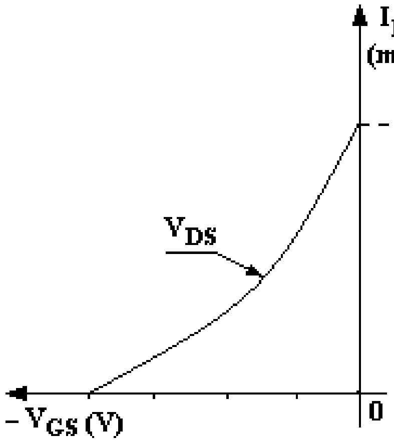
CHARACTERISTICS (COMMON SOURCE)

CIRCUIT DIAGRAM:

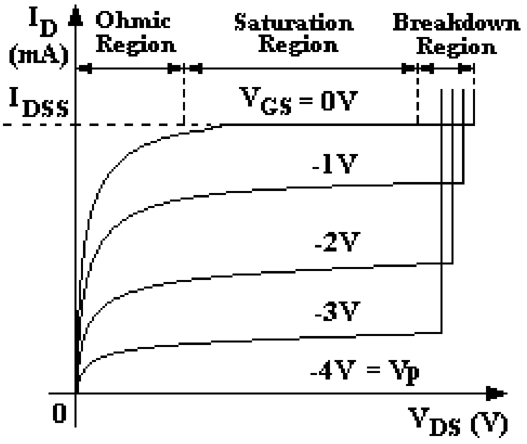


JFET Drain Characteristics

MODEL GRAPH:



FET Transfer Characteristics



FET Drain Characteristics

JFET DRAIN & TRANSFER CHARACTERISTICS (CS)

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 – 20mA)	1
4	D.C Voltmeters	(0 – 2V), (0 – 20V)	Each 1
5	Bread Board and connecting wires	--	1 Set

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	0.0			
2	0.5			
3	1.0			
4	1.5			
5	2.0			
6	2.5			
7	3.0			
8	3.5			
9	4.0			
10	4.5			
11	5.0			
12	5.5			
13	6.0			

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	0.0			
2	0.5			
3	1.0			
4	1.5			
5	2.0			

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 $\mathbf{r_d} = \Delta V_{DS} / \Delta I_D$ (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 $\mathbf{g_m} = \Delta I_D / \Delta V_{GS}$ (V_{DS} = constant).

CALCULATION OF μ :

$$\mu = g_m \times r_d.$$

RESULT:

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.

VIVA QUESTIONS:

7. What are the advantages of JFET over BJT?
8. Why input resistance in FET amplifier is more than the BJT amplifier?
9. What is a uni-polar device?
10. What is pinch off voltage?
11. What are various FETs?
12. What is Enhancement mode and Depletion mode?
13. Draw the Equivalent circuit of JFET for low frequencies?
14. Write the mathematical equation for g_m in terms of g_{mo}?
15. Write equation of FET I_D in terms of V_{GS} and V_p?

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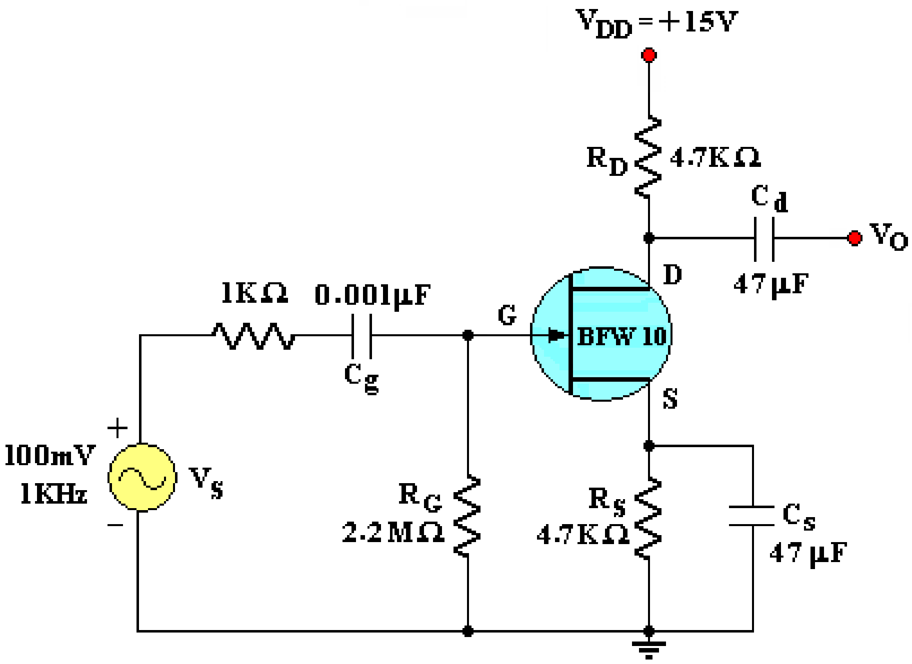
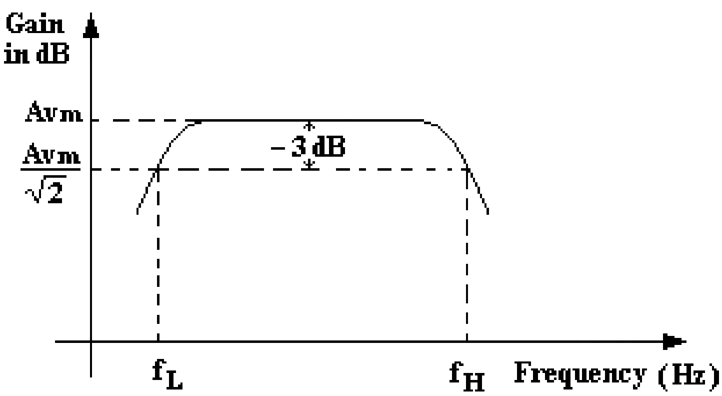
JFET AMPLIFIER (COMMON SOURCE)

CIRCUIT DIAGRAMS:



Common Source JFET Amplifier

MODEL GRAPH:



COMMON SOURCE JFET AMPLIFIER

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

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.

RESULT:

BandWidth , B.W = $f_2 - f_1$ = Hz

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.

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.

***

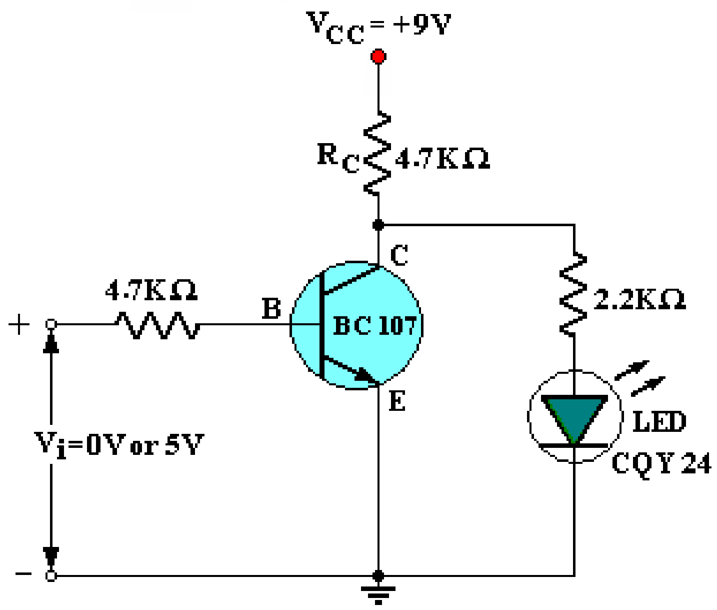
TABULAR FORMS:

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			

TRANSISTOR AS A SWITCH

CIRCUIT DIAGRAM:



Transistor as a Switch

RESULT:

TABULAR FORM:

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

TRANSISTOR AS A SWITCH

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 Volts	1
2	Transistor	BC – 107	1
3	Resistors	4.7K Ω, 2.2K Ω	Each 1
4	LED	CQY24	1
5	Bread Board and connecting wires	-	1 Set

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.

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.

VIVA QUESTIONS:

1. In which region of the characteristics transistor acts as a switch?
2. What is the typical value of the collector current on ON state?
3. How the junctions of Transistor are biased in ON state and OFF state?

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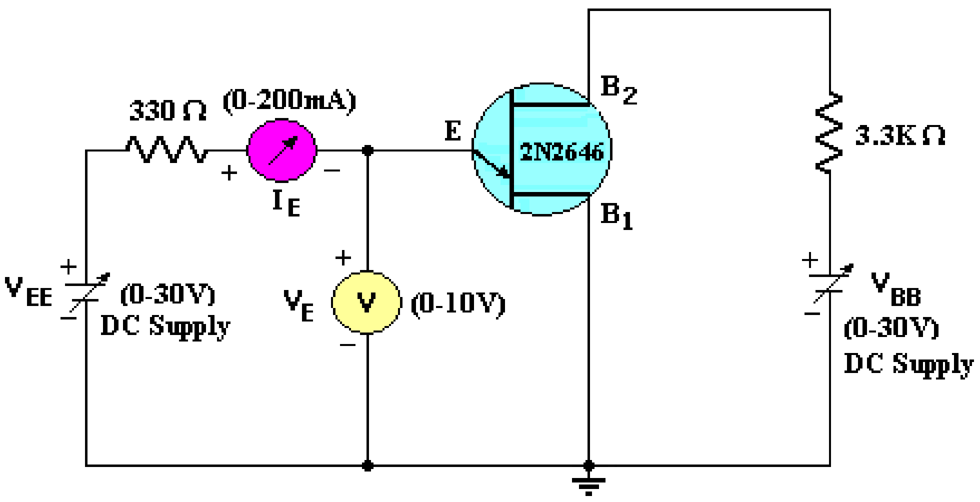
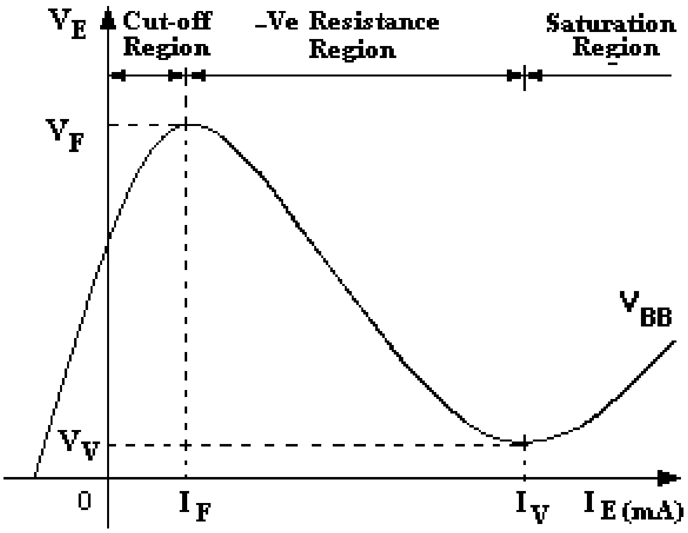
CHARACTERISTICS OF UJT

CIRCUIT DIAGRAMS:



UJT Characteristics

MODEL GRAPHS:



UJT Characteristics

UJT CHARACTERISTICS.

AIM: To obtain the V-I characteristics of UJT and plot its input negative resistance Characteristics also to find its Intrinsic Standoff Ratio

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Power supply	(0 – 30V)	1
2	Transistor	UJT 2N2646	1
3	Resistors	3.3KΩ, 330Ω	Each 1
4	Ammeter	(0 -100mA)	1
5	Voltmeter	(0 – 10V)	1
6	Bread Board and connecting wires	-	1 Set

PROCEDURE:

1. Connect the circuit as shown in above figure.
2. Keep V_{BB} = 5V, Vary V_{EE} smoothly with fine control such that V_E Varies in steps of 0.5 volts from zero and note down the resulting emitter current I_E for each step in the tabular form.
3. Repeat the experiment for V_{BB} = 7V and for V_{BB} = 10V.
4. Draw the graph between V_E Vs I_E by keeping V_{BB} constant.

TABULAR FORM:

V_{BB} = 5V		V_{BB} = 7V		V_{BB} = 10V	
Vs (volts)	I_E (mA)	Vs (volts)	I_E (mA)	Vs (volts)	I_E (mA)

RESULT:

VIVA QUESTIONS:

1. What are the applications of UJT?
2. Why UJT is called as a Relaxation Oscillator?
3. Which type of switch is used in UJT?
4. What is Intrinsic stand off ratio?
5. Why UJT is called a negative resistance device?
6. Draw the circuit schematic for UJT?
7. What are the applications of UJT in triggering circuits?
8. Write the equation for Intrinsic stand off ratio?
9. Define valley voltage in UJT?
10. How UJT can be used for firing the silicon controlled rectifiers?
11. What are applications of UJT in Bi stable circuits?
12. What is the main application of UJT?

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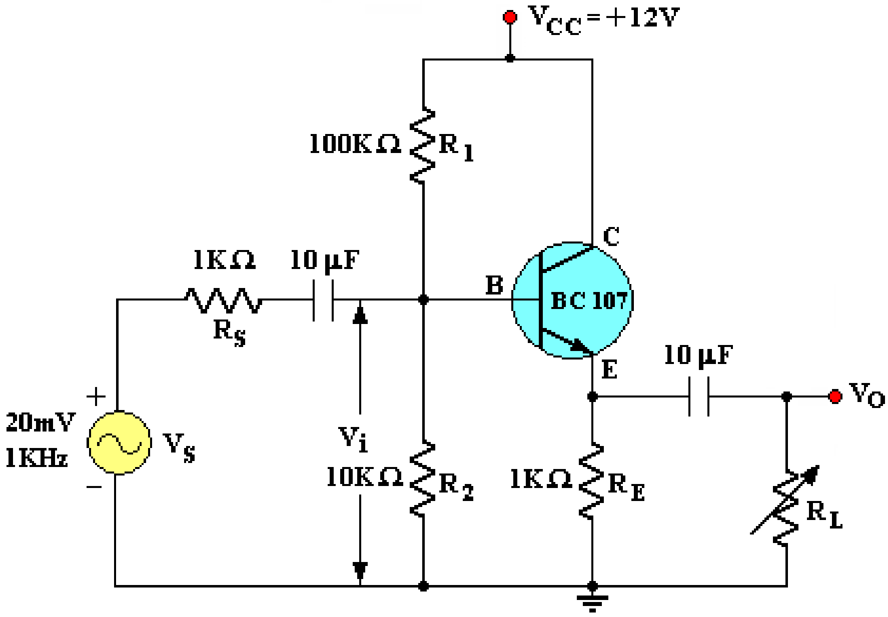
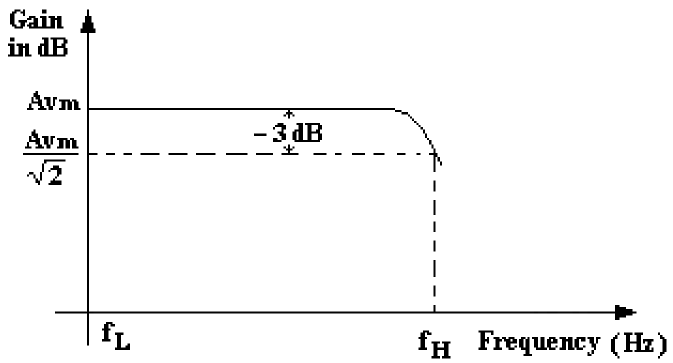
CC TRANSISTOR AMPLIFIER

CIRCUIT DIAGRAMS:



Common Collector Transistor Amplifier

MODEL GRAPH:



CC TRANSISTOR AMPLIFIER

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

APPARATUS:

S.No	Name	Range / Value	Quantity
1	Dual Regulated D.C Power supply	0–30 Volts	1
2	Transistor	BC-107	1
3	Capacitors	10µf	2
4	Resistors	100kΩ, 10KΩ	Each 1
5	Resistors	1KΩ	2
6	Potentio Meter	-	1
7	Bread Board and connecting wires	-	1 Set
8	Signal Generator	(0 – 1MHz)	1
9	Dual Trace CRO	20MHz	1

PROCEDURE:

1. Connect the circuit as per the Fig., Apply Vcc of 12 Volts DC.
2. Apply I/P Voltage of 50mV at 1KHz 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 Vo in a tabular form .
4. Calculate the Voltage Gain Av = Vo/Vs and note down in the tabular form.
5. Plot the frequency (f) Vs Gain (Av) on a semi-log Graph sheet
6. Draw a horizontal line at 0.707 times Av and note down the cut off points and the Bandwidth is given by B.W $= f_2 – f_1$.

INPUT RESISTANCE RI:

1. Apply I/p Voltage of 50mV at 1KHz from the Signal Generator and observe Voltage Vi across R2 on CRO
2. Without Disturbing the setup note Vi
   find Ii = (Vs – Vi) / Rs and Ri= Vi / Ii Ohms.

OUTPUT RESISTANCE RO:

1. Apply I/p Voltage of 50mV at 1KHz from the Signal Generator and observe the O/P on CRO
2. Connect a Potentio meter across the o/p terminals and without disturbing Vs adjust the potentiometer such that o/p falls to $V_0/2$
3. The Resistance of the potentiometer is equal to Ro.

TABULAR FORMS:

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			

RESULT:

Band Width	B.W = f2 – f1 =	Hz
Voltage Gain	Av =	
Input Resistance	Ri =	ohms
Output Resistance	Ro =	ohms

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

VIVA QUESTIONS:

1. What is the other name for CC Amplifier?
2. What are the uses of CC Amplifier?
3. Why this amplifier has got the name Emitter Follower?
4. What is the maximum Voltage gain of an Emitter Follower?
5. Why it is used as a Buffer amplifier?

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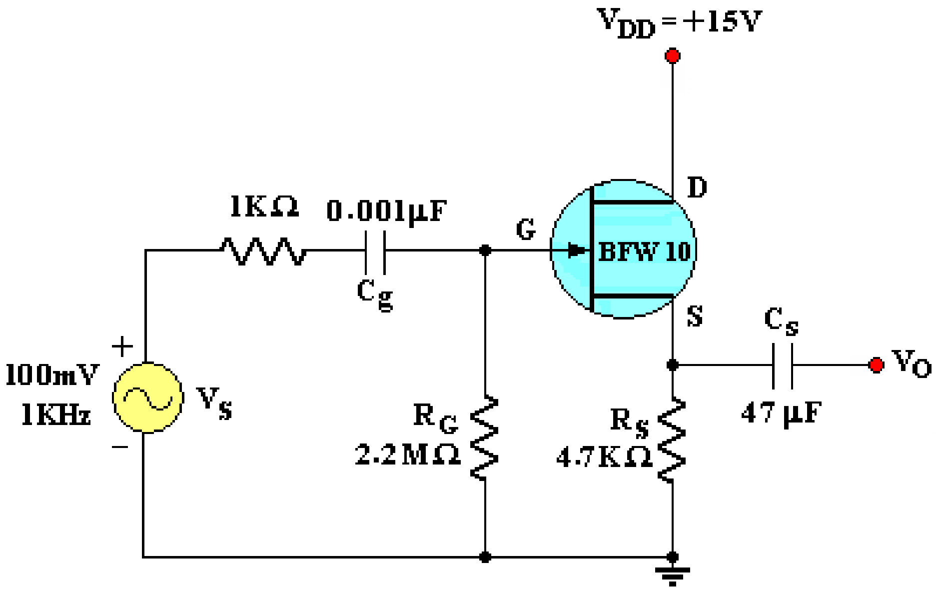
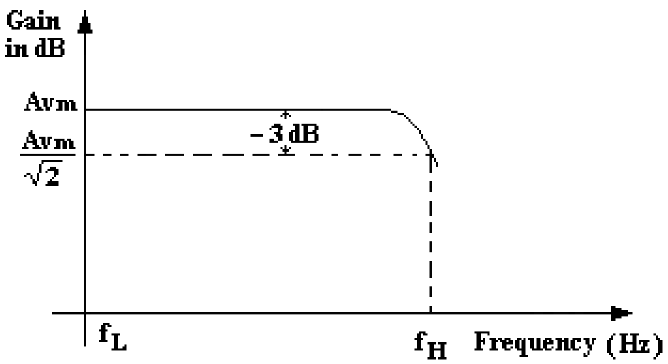
COMMON DRAIN JFET AMPLIFIER

CIRCUIT DIAGRAMS:



Common Drain JFET Amplifier

MODEL GRAPH:



COMMON DRAIN JFET AMPLIFIER

AIM: To obtain the frequency response of a Common Drain Field Effect Transistor Amplifier and also to find its voltage gain ,Output Resistance and Bandwidth.

APPARATUS:

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

PROCEDURE:

FREQUENCY RESPONSE:

1. Connect the circuit as per the Fig.1. Apply V_{DD} of 15 V
2. Give a signal Vs of 100 mV(P-P) at 1KHz on the I/P side and observe the O/P on CRO.
3. Vary the frequency from 50 Hz to 1MHz with proper intervals on the input side and observe the output Vo on CRO
4. Draw a graph between frequency Vs Gain on Semi-log Graph Sheet and find its Mid frequency Gain A_{mid}
5. Draw a horizontal line across the graph at 0.707 A_{mid} and find the Bandwidth

TO FIND R_0:

1. Keep Vs = 100mV (P-P) 1KHz Signal and find Corresponding output Vo.
2. Now with out disturbing Vs Connect potentiometer across output and observe the output on CRO.
3. Adjust the value of Potentiometer Such that the output falls to the Vo/2 value.
4. Note the value of the potentiometer resistance is the Ro of the JFET CD Amplifier.

TABULAR FORMS:

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			

RESULT:

BandWidth B.W $= f_2 - f_1 =$ Hz
Mid band Gain $A_{Mid} =$
Output Resistance Ro = ohms

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 we will get a gain of 0.9 to 1.0 at 1KHz. If not change the JFET.

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.

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