LABORATORY MANUAL
ANALOG ELECTRONICS

II B.TECH -II SEMESTER (ECE)

AY-2018-2019

Prepared by
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LIST OF EXPERIMENTS:

The following experiments are simulated in simulation laboratory using Multisim software and also tested in AE Hardware lab using discrete components.

1. Common Emitter Amplifier
2. Common Base Amplifier
3. Common Source amplifier
4. Two Stage RC Coupled Amplifier
5. Current Shunt Feedback Amplifier
6. Voltage Series Feedback Amplifier
7. Cascode Amplifier
8. Wien Bridge Oscillator using Transistors
9. RC Phase Shift Oscillator using Transistors
10. Class A Power Amplifier (Transformer less)
11. Class B Complementary Symmetry Amplifier
12. Hartley Oscillator
13. Colpitt’s Oscillator
14. Single Tuned Voltage Amplifier

EXPT NO: 1.A

COMMON EMITTER AMPLIFIER (Software)
PRELAB:

1. Study the operation and working principle of CE amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).
4. In this lab you will use "decibels", or dB. This is a dimensionless ratio, in logarithmic form.
   Calculate the following:
   a. The gain in dB of an amplifier with a gain of 10,000.
   b. The gain in dB of an amplifier with a gain of 0.1.
   c. The voltage ratio that corresponds to – 3 dB.

OBJECTIVE:

1. To simulate the Common Emitter amplifier in Multisim and study the transient and frequency response.
2. Obtain the frequency response characteristics of CE amplifier by hardware implementation.
3. To determine the phase relationship between the input and output voltages by performing the transient analysis.
4. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of CE amplifier by performing the AC analysis.
5. Determine the effects of input signal frequency on capacitor coupled common emitter amplifiers

SOFTWARE TOOL: Multisim

APPARATUS:

1.	Regulated power supply (12V)	-	1 No.
2.	Function generator	-	1 no.
3.	CRO	-	1 No.
4.	Transistor (BC 107 or 2N2222)	-	1 No.
5.	Resistors (5KΩ,47 KΩ,2 KΩ, ,1 KΩ)	-	1 No. each
6.	Resistor (10 KΩ)	-	2 Nos.
7.	Capacitors (10 μF, 1 μF)	-	1,2 No. each
8.	Bread Board	-	1 No.
9.	Connecting wires		

CIRCUIT DIAGRAM:

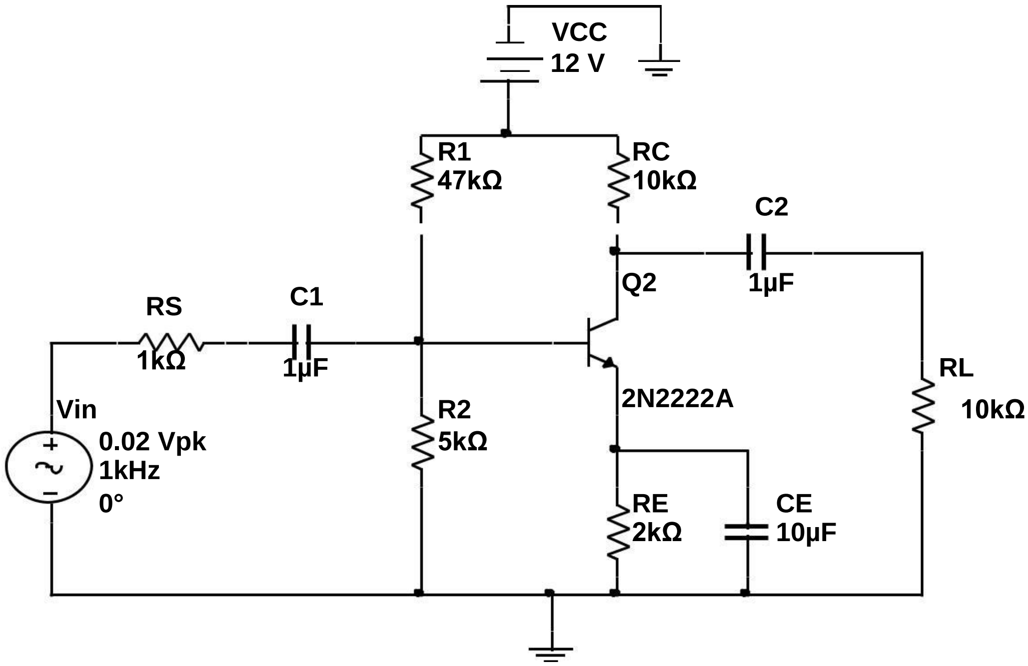


Fig:1.a Common Emitter Amplifier circuit diagram

THEORY:

The practical circuit of CE amplifier is shown in the figure. It consists of different circuit components. The functions of these components are as follows:

1. **Biasing Circuit**: The resistances R1, R2 and RE form the voltage divider biasing circuit for the CE amplifier. It sets the proper operating point for the CE amplifier.
2. **Input capacitor C1**: This capacitor couples the signal to the transistor. It blocks any dc component present in the signal and passes only ac signal for amplification. Because of this, biasing conditions are maintained constant.
3. **Emitter Bypass Capacitor CE**: An emitter bypass capacitor CE is connected in parallel with the emitter resistance, RE to provide a low reactance path to the amplified ac signal. If it is not inserted, the amplified ac signal passing through RE will cause a voltage drop across it. This will reduce the output voltage, reducing the gain of the amplifier.
4. **Output Coupling Capacitor C2**: The coupling capacitor C2 couples the output of the amplifier to the load or to the next stage of the amplifier. It blocks DC and passes only AC part of the amplified signal.

OPERATION:

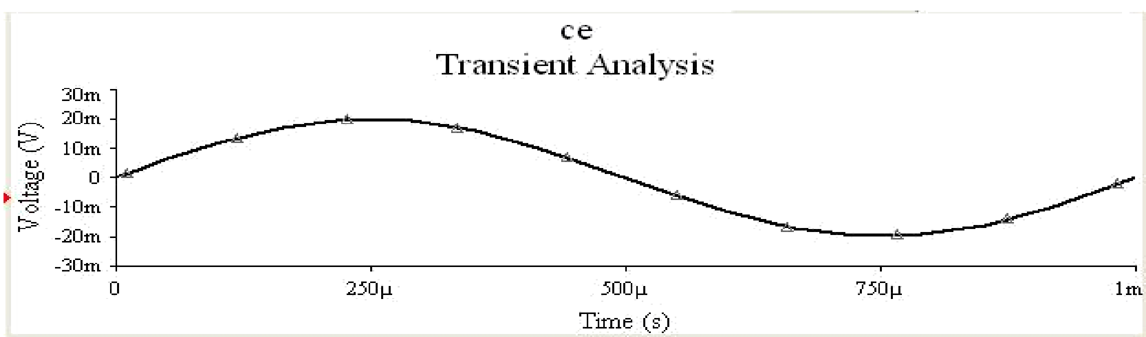
When positive half of the signal is applied, the voltage between base and emitter (V_{be}) is increased because it is already positive with respect to ground. So forward bias is increased i.e., the base current is increased. Due to transistor action, the collector current I_C is increased times. When this current flows through R_C the drop I_C R_C increases considerably. As a consequence of this, the voltage between collector and emitter (V_{ce}) decreases. In this way, amplified voltage appears across RC). Therefore the positive going input signal appears as a negative going output signal i.e., there is a phase shift of 180° between the input and output.

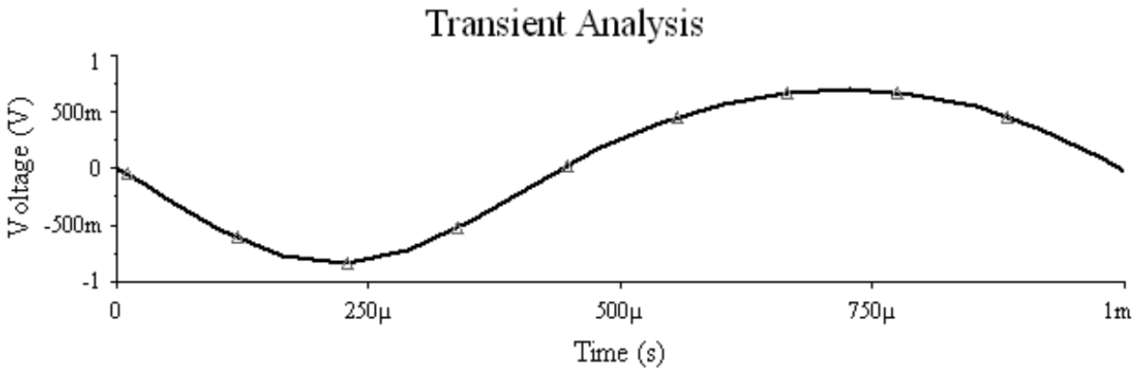
PROCEDURE:

1. Open Multisim Software to design Common Emitter amplifier circuit
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and set oscillator (FG) frequency & amplitude.
4. Check the connections and the specification of components value properly.
5. Go for simulation using Run Key observe the output waveforms on CRO
6. Indicate the node names and go for AC Analysis with the output node
7. Observe the Ac Analysis and draw the magnitude response curve
8. Calculate the bandwidth of the amplifier

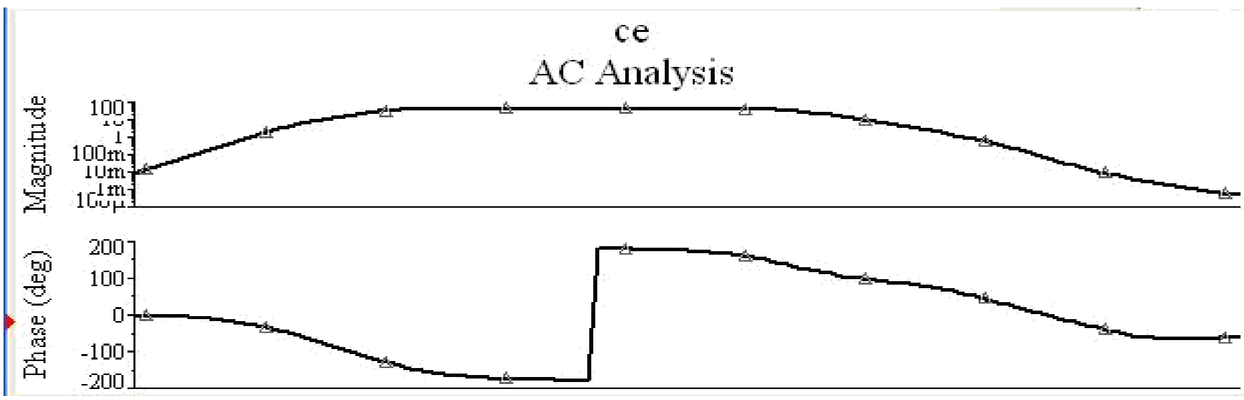
OBSERVATIONS/GRAPHS:

TRANSIENT RESPONSE:





FREQUENCY RESPONSE



INFERENCE:

1. From the transient analysis the phase relationship between input and output voltage signals is ____________ degrees.
2. From the frequency response curve the following results are calculated

S. No.	**Parameter**	**Value**
1	Max. Absolute Gain	
2	Max. Gain in dB	
3	3dB Gain	
4	Lower Cutoff Frequency	
5	Upper Cutoff Frequency	
6	Bandwidth	

APPLICATIONS:

1. The common emitter circuit is popular because it’s well-suited for voltage amplification, especially at low frequencies.
2. Common-emitter amplifiers are also used in radio frequency transceiver circuits.
3. Common emitter configuration commonly used in low-noise amplifiers.

VIVA QUESTIONS:

1. Why the CE amplifier provides a phase reversal?
2. In the dc equivalent circuit of an amplifier, how are capacitors treated?
3. What is the effect of bypass capacitor on frequency response?
4. Define lower and upper cutoff frequencies for an amplifier.
5. State the reason for fall in gain at low and high frequencies.
6. What is meant by unity gain frequency?
7. Define Bel and Decibel.
8. What do we represent gain in decibels?
9. Why do you plot the frequency response curve on a semi-log paper?
10. Explain the function of emitter bypass capacitor C_E?
11. What is the equation for voltage gain?
12. What is cut off frequency? What is lower 3dB and upper 3dB cut off frequency?
13. What are the applications of CE amplifier?
14. What is active region?
15. What is Bandwidth of an amplifier?
16. What is the importance of gain bandwidth product?
17. Draw h parameter equivalent circuit of CE amplifier.
18. What is the importance of coupling capacitors in CE amplifier?
19. What is the importance of emitter by pass capacitor?
20. What type of feedback is used in CE amplifier?
21. What are the various types of biasing a Transistor?
22. What is Q point of operation of the transistor? What is the region of operation of the transistor when it is working as an amplifier?
23. Why frequency response of the amplifier is drawn on semi-log scale graph?
24. If Q point is not properly selected, then what will be the effect on the output waveform?
25. What are the typical values of the input impedance and output impendence of CE amplifier?
26. What is meant by unity gain frequency?
27. Define Bel and Decibel?
28. What do we represent gain in decibels?
29. Why do you plot the frequency response curve on a semi-log paper?
30. In the dc equivalent circuit of an amplifier, how are capacitors treated?

EXERCISE:

1. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 50K.
2. Input & output characteristics of BC 107 transistor in CE configuration with R_O = 2K.
3. I/O characteristics of BC 107 transistor in CE configuration with R_I = 50K R_O = 2K
4. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 150K.
5. I/O characteristics of BC 107 transistor in CE configuration with R_I = 150K R_O = 2K
6. Input & output characteristics of SL 100 transistor in CE configuration with R_I = 50K.
7. Input & output characteristics of SL 100 transistor in CE configuration with R_O = 2K.
8. I/O characteristics of PNP transistor in CE configuration with R_I = 50K R_O = 2K
9. Input & output characteristics of PNP transistor in CE configuration with R_I = 150K.
10. I/O characteristics of PNP transistor in CE configuration with R_I = 150K R_O = 2K
11. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 50K.
12. Input & output characteristics of BC 107 transistor in CE configuration with R_O = 2K.
13. I/O characteristics of BC 107 transistor in CE configuration with R_I = 50K R_O = 2K
14. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 150K.
15. I/O characteristics of BC 107 transistor in CE configuration with R_I = 150K R_O = 2K
16. Input & output characteristics of SL 100 transistor in CE configuration with R_I = 50K.
17. Input & output characteristics of SL 100 transistor in CE configuration with R_O = 2K.
18. I/O characteristics of PNP transistor in CE configuration with R_I = 50K R_O = 2K
19. Input & output characteristics of PNP transistor in CE configuration with R_I = 150K.
20. I/O characteristics of PNP transistor in CE configuration with R_I = 150K R_O = 2K
21. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 50K.
22. Input & output characteristics of BC 107 transistor in CE configuration with R_O = 2K.
23. I/O characteristics of BC 107 transistor in CE configuration with R_I = 50K R_O = 2K
24. Input & output characteristics of BC 107 transistor in CE configuration with R_I = 150K.
25. I/O characteristics of BC 107 transistor in CE configuration with R_I = 150K R_O = 2K
26. Input & output characteristics of SL 100 transistor in CE configuration with R_I = 50K.
27. Input & output characteristics of SL 100 transistor in CE configuration with R_O = 2K.
28. I/O characteristics of PNP transistor in CE configuration with R_I = 50K R_O = 2K
29. Input & output characteristics of PNP transistor in CE configuration with R_I = 150K.
30. I/O characteristics of PNP transistor in CE configuration with R_I = 150K R_O = 2K

EXPT NO: 1.B

COMMON EMITTER AMPLIFIER (Hardware)

AIM: -

1. Plot the frequency response of a BJT amplifier in common emitter configuration.
2. Calculate gain.
3. Calculate bandwidth.

COMPONENTS & EQUIPMENTS REQUIRED: -

S.No	Device	Range/Rating	Qty
1.	(a) DC supply voltage (b) BJT (c) Capacitors (d) Resistors	12V BC107 BP 100 F,10 F 5.6K ,10k ,22K ,,1k 220 ,	1 1 2,1 Each 1NO
2.	Signal generator	0.1Hz-1MHz	1
3.	CRO	0Hz-20MHz	1
4.	Connecting wires	5A	4

CIRCUITDIAGRAM:

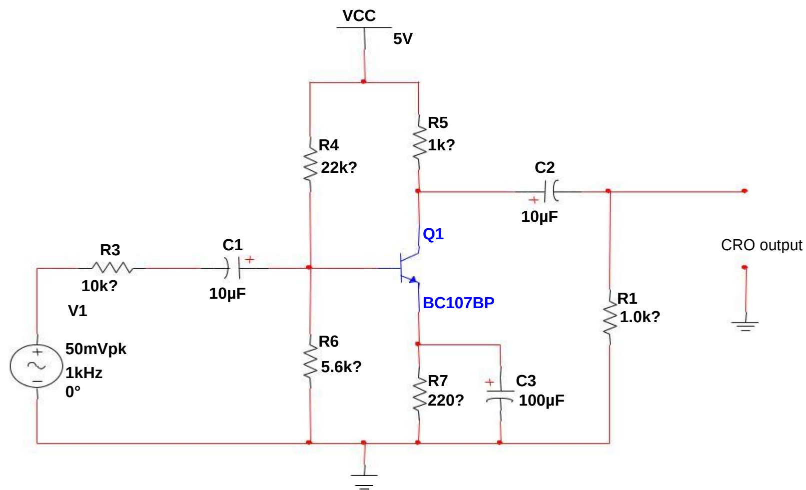


Fig: 1.b Common Emitter Amplifier circuit diagram

PROCEDURE: -

1. Connect the circuit diagram as shown in figure for common emitter amplifier.
2. Adjust input signal amplitude in the function generator and observe an amplified voltage at the output without distortion.
3. By keeping input signal voltage, say at 50mV, vary the input signal frequency from 0 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.
4. Find the voltage gain, $A_V = \frac{V_O}{V_{in}}$, $A_{V(dB)} = 20\log\frac{V_O}{V_{in}}$
5. Plot A_V Vs frequency on a semi-log sheet.

PRECAUTIONS:

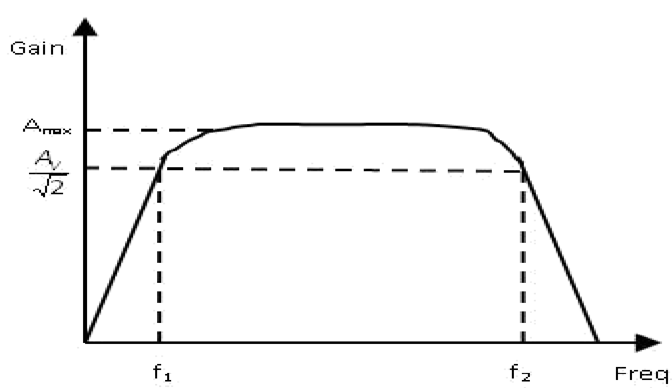
Avoid loose connections give proper input voltage

TABULAR COLUMN: **Input = 50mV**

Frequency(in Hz)	OutputVoltage (V_o)	Gain $A_v=V_o/V_i$	Gain(in dB) $=20\log_{10}(V_o/V_i)$
20			
50			
100			
1k			
10k			
100k			
200,500K			
1M			

RESULT: -

1. Frequency response of BJT amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H--f_L = _________Hz.



EXPT NO: 2.A

COMMON BASE AMPLIFIER (Software)
PRELAB:

1. Study the operation and working principle of CB amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim tool (Schematic & Circuit File).

OBJECTIVE:

1. To simulate the Common Base amplifier in Multisim and study the transient and frequency response.
2. Obtain the frequency response characteristics of CB amplifier by hardware implementation.
3. To determine the phase relationship between the input and output voltages by performing the transient analysis.
4. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of CB amplifier by performing the AC analysis.
5. Determine the effects of input signal frequency on common Base. amplifiers

SOFTWARE TOOL:

Multisim.

APPARATUS:

1.	Regulated power supply	-	1 No.
2.	Function generator	-	1 No.
3.	CRO	-	1 No.
4.	Transistor (BC 107 or 2N2222)	-	1 No.
5.	Resistors (20KΩ)	-	1 No.
6.	Resistor (10 KΩ)	-	2 Nos.
7.	Capacitors (10 µF,)	-	2 Nos.
8.	Bread Board	-	1 No.
9.	Connecting wires		

CIRCUIT DIAGRAM:

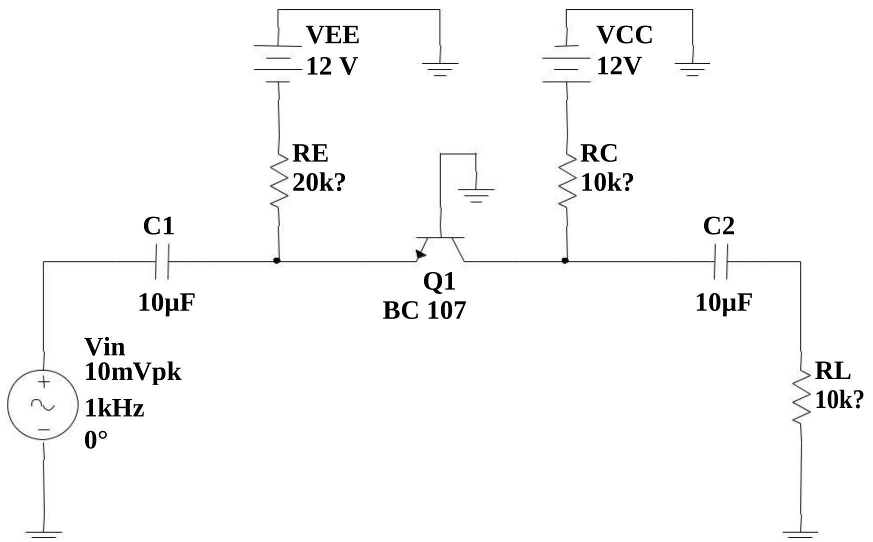


Fig: 1.b Common base Amplifier circuit diagram

THEORY:

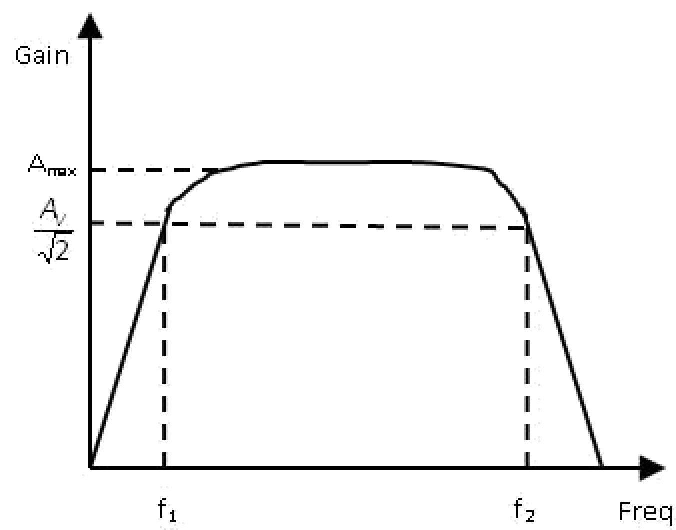
In Common Base Amplifier Circuit Base terminal is common to both the input and output terminals. In this Circuit input is applied between emitter and base and the output is taken from collector and the base. As we know, the emitter current is greater than any other current in the transistor, being the sum of base and collector currents i.e. $I_E = I_B + I_C$ In the CE and CC amplifier configurations, the signal source was connected to the base lead of the transistor, thus handling the least current possible. Because the input current exceeds all other currents in the circuit, including the output current, the current gain of this amplifier is actually less than 1 (notice how R_{load} is connected to the collector, thus carrying slightly less current than the signal source). In other words, it attenuates current rather than amplifying it. With common-emitter and common-collector amplifier configurations, the transistor parameter most closely associated with gain was β. In the common-base circuit, we follow another basic transistor parameter: the ratio between collector current and emitter current, which is a fraction always less than 1. This fractional value for any transistor is called the alpha ratio, or α ratio.($\alpha = I_C/I_E$) Since it obviously can't boost signal current, it only seems reasonable to expect it to boost signal voltage.

Operation: The positive going Pulse of input Source increases the emitter voltage. As the base voltage is Constant, the forward bias of emitter base junction reduces. This reduces I_B, reducing I_C and hence the drop across R_C since $V_O = V_{CC} - I_C R_C$, the reduction in I_C results in an increase in V_O. Therefore, we can Say that positive going input produces positive going output and similarly negative going input produces negative going output and there is no phase shift between input and output in a common base Amplifier.

PROCEDURE:

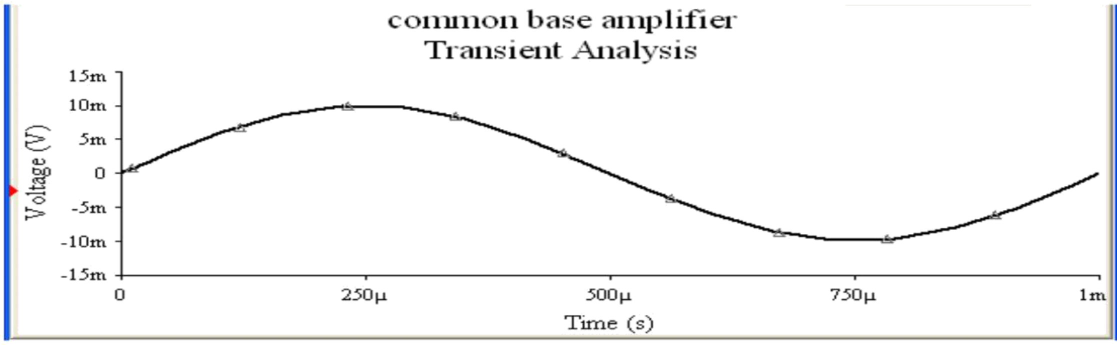
1. Open Multisim Software to design Common Base amplifier circuit
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and set oscillator (FG) frequency & amplitude.
4. Check the connections and the specification of components value properly.
5. Go for simulation using Run Key observe the output waveforms on CRO
6. Indicate the node names and go for AC Analysis with the output node
7. Observe the Ac Analysis and draw the magnitude response curve
8. Calculate the bandwidth of the amplifier

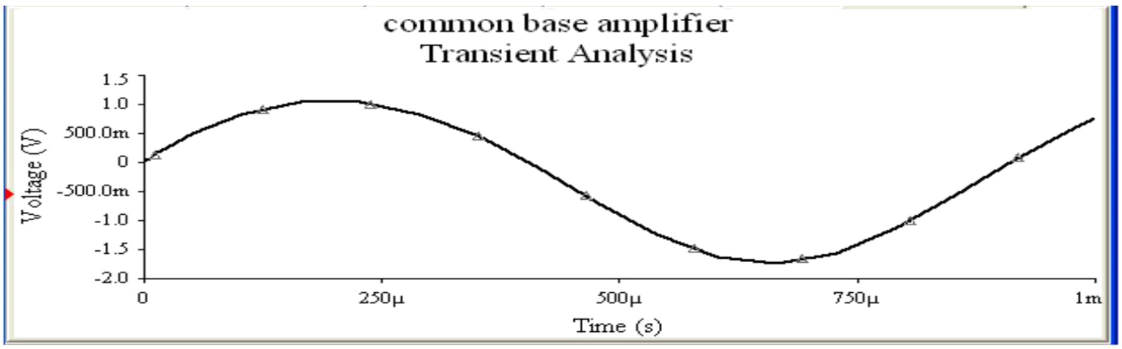
1. EXPECTED GRAPHS:



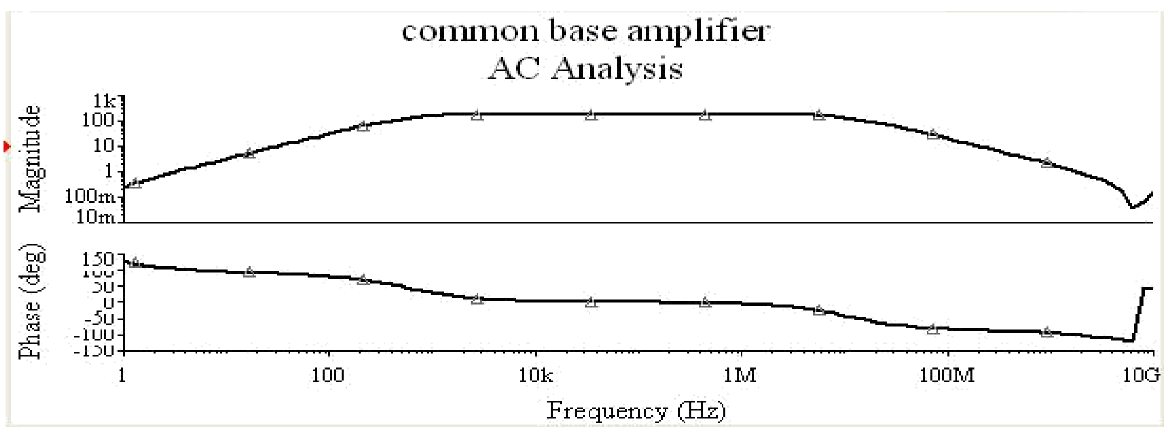
OBSERVATIONS / GRAPHS:

TRANSIENT RESPONSE:





FREQUENCY RESPONSE:



RESULTS:

1. From the transient analysis the phase relationship between input and output voltage signals is ____________ degrees.
2. From the frequency response curve the following results are calculated:

S. No.	Parameter	Value
1	Max. Absolute Gain	
2	Max. Gain in dB	
3	3dB Gain	
4	Lower Cutoff Frequency	
5	Upper Cutoff Frequency	
6	Bandwidth	

APPLICATIONS:

This arrangement is not very common in low-frequency discrete circuits, where it is usually employed for amplifiers that require an unusually low input impedance, for example to act as a preamplifier for moving-coil microphones. However, it is popular in integrated circuits and in high-frequency amplifiers, for example for VHF and UHF, because its input capacitance does not suffer from the Miller effect, which degrades the bandwidth of the common emitter configuration, and because of the relatively high isolation between the input and output. This high isolation means that there is little feedback from the output back to the input, leading to high stability. This configuration is also useful as a current buffer since it has a current gain of approximately unity (see formulas below). Often a common base is used in this manner, preceded by a common emitter stage. The combination of these two form the cascode configuration, which possesses several of the benefits of each configuration, such as high input impedance and isolation.

VIVA QUESTIONS:

1. Suppose the source resistance of VIN is 50Ω. Will the CB amplifier perform well in amplifying the signal from Vin? Why?
2. Why the CB amplifier is commonly used as a current buffer?
3. What is input terminal for CB amplifier
4. What is the power gain of CB Amplifier
5. What is the nature of input impedance for CB amplifier
6. Does any phase shift occur in CB amplifier
7. What is the nature of output impedance of CB amplifier
8. What are the Applications of common base?
9. What are the advantages of common base amplifier?
10. What are common base uses?
11. What is Bandwidth of an amplifier?
12. What is the importance of gain bandwidth product?
13. What does the Base Common amplifier amplify? And how?
14. What is Common Base configuration?

15. What are the characteristics of CB?
16. What is an amplifier?
17. Why the CB amplifier is commonly used as a current buffer?
18. What is input terminal for CB amplifier?
19. What is the power gain of CB Amplifier?
21. What is the equation for voltage gain?
22. What is cut off frequency? What is lower 3dB and upper 3dB cut off frequency?
23. What are the applications of CB amplifier?
24. Difference between CE and CB amplifier?
25. What is the power gain of CB Amplifier?
26. What is the nature of input impedance for CB amplifier?
27. Does any phase shift occur in CB amplifier?
28. What is the nature of output impedance of CB amplifier?
29. What is the equation for voltage gain?
30. What is cut off frequency? What is lower 3dB and upper 3dB cut off frequency?

EXERSISE:

1. Input & output characteristics of transistor in CB configuration with R_I = 5K.
2. Input & output characteristics of transistor in CB configuration with R_O = 2K.
3. Input & output characteristics of transistor in CB configuration with R_I = 5K, R_O = 2K.
4. Input & output characteristics of Ge transistor in CB configuration with R_I = 5K.
5. Input & output characteristics of Ge transistor in CB configuration with R_O = 2K.
6. Input & output characteristics of PNP transistor in CB configuration with R_I = 5K.
7. Input & output characteristics of PNP transistor in CB configuration with R_O = 2K.
8. I/p & O/p characteristics of PNP transistor in CB configuration with R_I = 5K, R_O = 2K.
9. Input & output characteristics of PNP Ge transistor in CB configuration with R_I = 5K.
10. Input & output characteristics of PNP Ge transistor in CB configuration with R_O = 2K.
11. Find input Resistance of CB configuration for given transistor
12. Find output conductance of CB configuration for given transistor
13. Find current gain of CB configuration for given transistor
14. Find Voltage gain of CB configuration for given transistor
15. Find Reverse Voltage gain of CB configuration for given transistor
16. Find output Resistance of CB configuration for given transistor
17. Input & output characteristics of transistor in CB configuration with R_I = 5K.
18. Input & output characteristics of transistor in CB configuration with R_O = 2K.
19. Input & output characteristics of transistor in CB configuration with R_I = 5K, R_O = 2K.
20. Input & output characteristics of Ge transistor in CB configuration with R_I = 5K.
21. Input & output characteristics of Ge transistor in CB configuration with R_O = 2K.
22. Input & output characteristics of PNP transistor in CB configuration with R_I = 5K.
23. Input & output characteristics of PNP transistor in CB configuration with R_O = 2K.
24. I/p & O/p characteristics of PNP transistor in CB configuration with R_I = 5K, R_O = 2K.
25. Input & output characteristics of PNP Ge transistor in CB configuration with R_I = 5K.
26. Input & output characteristics of PNP Ge transistor in CB configuration with R_O = 2K.
27. Find input Resistance of CB configuration for given transistor
28. Find output conductance of CB configuration for given transistor
29. Find current gain of CB configuration for given transistor
30. Find Voltage gain of CB configuration for given transistor

EXPT NO: 2.B

COMMON BASE AMPLIFIER (Hardware)

AIM: -

1. Plot the frequency response of a BJT amplifier in common base configuration.
2. Calculate gain.
3. Calculate bandwidth.

COMPONENTS & EQUIPMENTS REQUIRED: -

S.No	Device	Range/Rating	Qty
1.	(a) DC supply voltage (b) BJT (c) Capacitors (d) Resistors	12V BC107 10 F,100 F, 220 ,22K ,1k 5.6K ,10k	1 1 2 1 1
2.	Signal generator	0.1Hz-1MHz	1
3.	CRO	0Hz-20MHz	1
4.	Connecting wires	5A	As per circuit

CIRCUIT DIAGRAM:

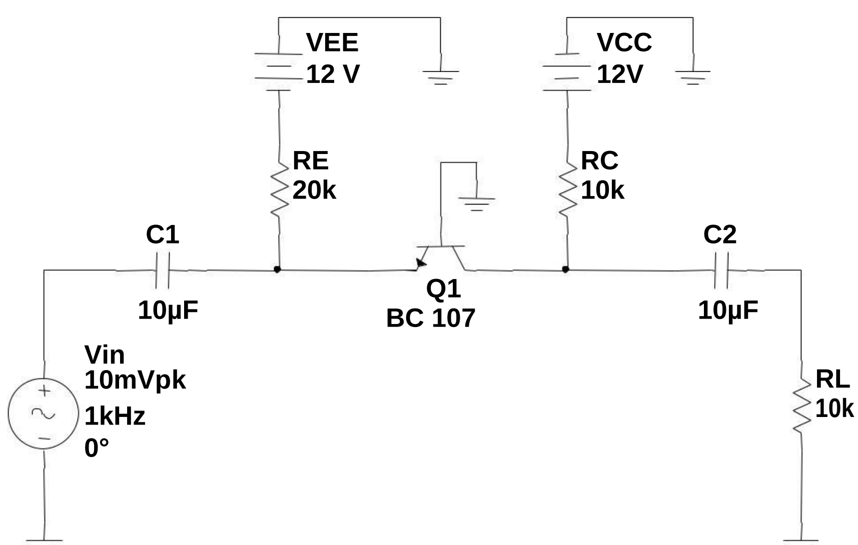


Fig: 1.b Common Emitter Amplifier circuit diagram

PROCEDURE: -

1. Connect the circuit diagram as shown in figure for common base amplifier.
2. Adjust input signal amplitude in the function generator and observe an amplified voltage at the output without distortion.
3. By keeping input signal voltage, say at 50mV, vary the input signal frequency from 0 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.
4. Find the voltage gain, $A_V = \frac{V_O}{V_{in}}$, $A_{V(dB)} = 20\log \frac{V_O}{V_{in}}$.
5. Plot A_V Vs frequency on a semi-log sheet.

PRECAUTIONS:

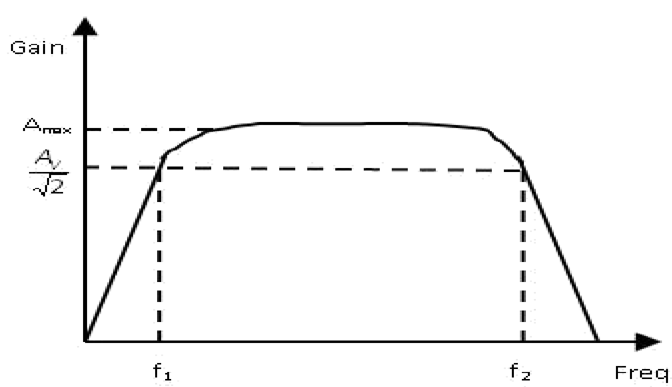
Avoid loose connections give proper input voltage

TABULAR COLUMN: **Input = 50mV**

Frequency(in Hz)	OutputVoltage (V_o)	Gain A_v=V_o/V_i	Gain(in dB) =20$\log_{10}$(V_o/V_i)
20			
50			
100			
1k			
10k			
100k			
200,500K			
1M			

RESULT: -

3. Frequency response of BJT in CB mode amplifier is plotted.
4. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.



EXPT NO: 3.A

COMMON SOURCE AMPLIFIER (Software)

PRELAB:

1. Study the operation and working principle of CS amplifier.
2. Identify all the formulae you will need in this Lab.
3. Study the procedure of using Multisim (Schematic & Circuit File).

OBJECTIVE:

1. To simulate the Common Source amplifier in Multisim and study the transient and frequency response.
2. Obtain the frequency response characteristics of CS amplifier by hardware implementation.
3. To determine the phase relationship between the input and output voltages by performing the transient analysis.
4. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of CS amplifier by performing the AC analysis.
5. Determine the effects of input signal frequency on Common Source amplifiers

SOFTWARE TOOL: Multisim

APPARATUS:

Regulated power supply	-	1 No.
Function generator.	-	1 No.
CRO	-	1 No.
FET (BFW 10).	-	1 No.
Resistors (2.2 MΩ, 10 KΩ, 4.7 KΩ, 470 Ω)	-	1.No. each
Capacitors (100 µF, 10 µF)	-	2 No. each
Breadboard.	-	1 No.
Connecting wires		

CIRCUIT DIAGRAM:

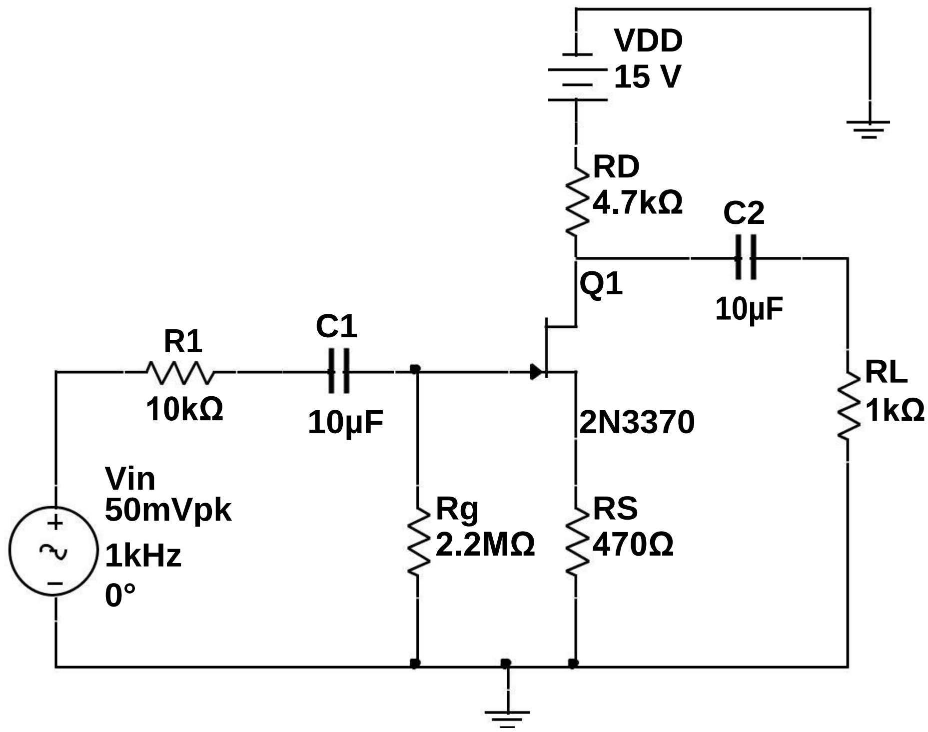


Fig: 3.a Common Source Amplifier circuit Diagram

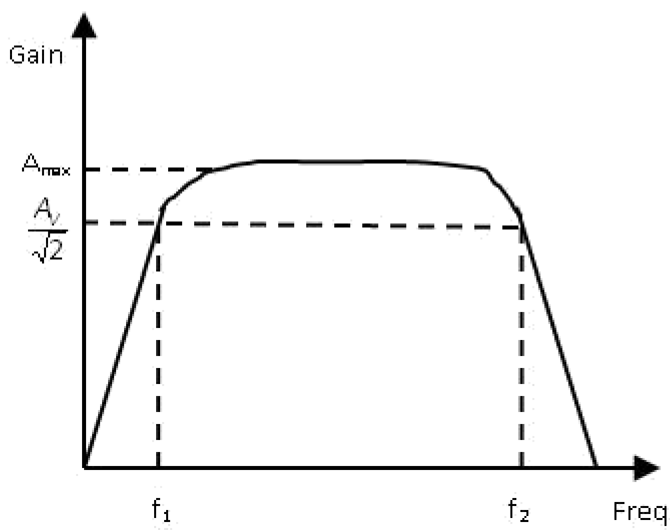
THEORY:

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.

PROCEDURE:

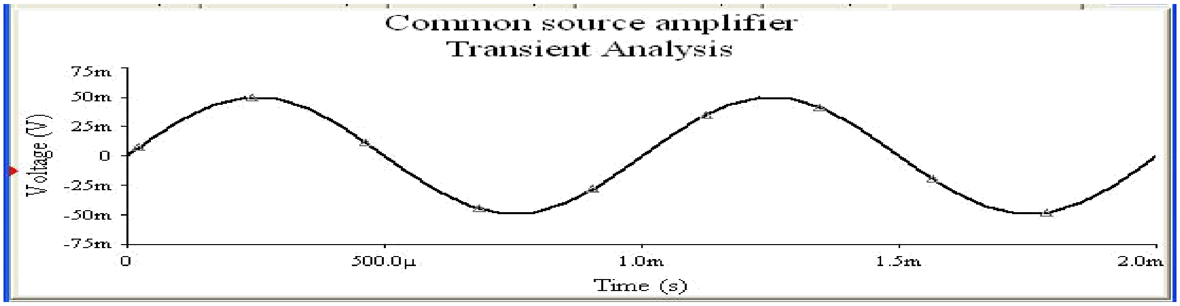
1. Select on New editor window and place the required component CS amplifier on the circuit window.
2. Make the connections using wire and check the connections and oscillator.
3. Go for simulation and using Run Key observe the output waveforms on CRO
4. Indicate the node names and go for AC Analysis with the output node
5. Observe the Transient response , Ac Analysis and draw the magnitude response curve
6. Calculate the bandwidth of the amplifier
7. Open Multisim Software to design FET common source amplifier circuit

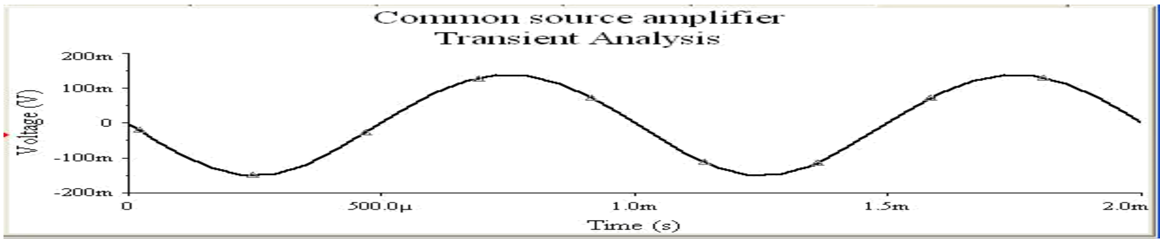
EXPECTED GRAPHS:



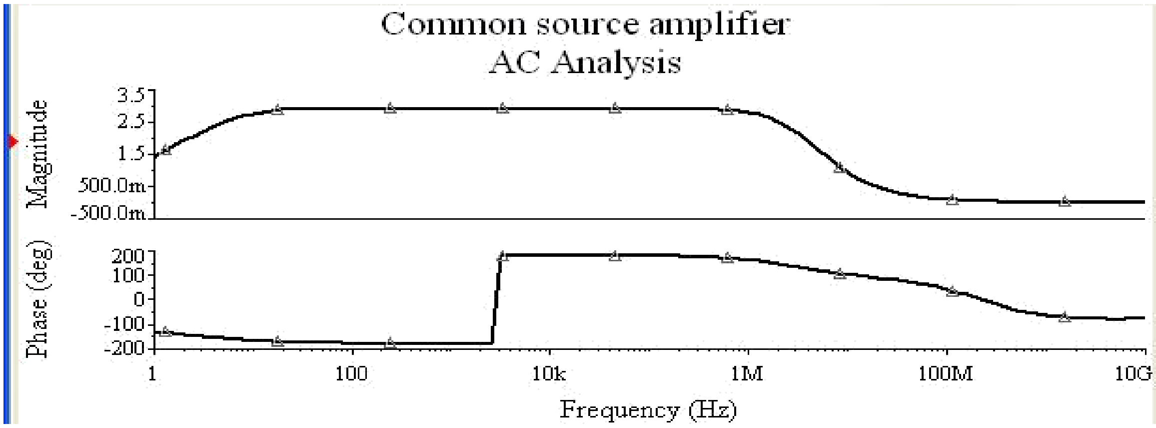
OBSERVATIONS / GRAPHS:

TRANSIENT RESPONSE:





FREQUENCY RESPONSE



INFERENCE:

1. From the transient analysis the phase relationship between input and output voltage signals is ___________ degrees.
2. From the frequency response curve the following results are calculated:

S. No.	Parameter	Value
1	Max. Absolute Gain	
2	Max. Gain in dB	
3	3dB Gain	
4	Lower Cutoff Frequency	
5	Upper Cutoff Frequency	
6	Bandwidth	

REALTIME APPLICATIONS:

The common-source (CS) amplifier 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 cascode amplifier

VIVA QUESTIONS:

1. What is Miller effect on common source amplifier?
2. What is the purpose of source resistor and gate resistor?
3. What is swamping resistor
4. What is the purpose of swamping resistor in common source amplifier
5. FET is a liner or non-linear device. And justify your answer
6. What is square law and give an example for a square law device Why FET is called as unipolar device?
7. Why the common-source (CS) amplifier may be viewed as a transconductance amplifier or as a voltage amplifier?
8. What are the characteristics of JFET source amplifier?
9. What is the impedance of FET?
10. What are the comparisons and differences between a BJT and a JFET?
11. What is meant by a unipolar device?
12. Why is a JFET known as a Unipolar Device?
13. Draw the symbols of JFET, MOSFET?
14. What are the typical applications of a JFET?
15. Explain pinch off voltage and region?
16. What is Bandwidth of an amplifier?
17. What is the importance of gain bandwidth product?
18. What are the characteristics of JFET source amplifier? What is the impedance of FET?
19. What is an amplifier?
20. If a Q point is not properly selected, then what will be the effect on the output waveform?
21. What is the purpose of swamping resistor in common source amplifier
22. FET is a liner or non-linear device. And justify your answer
23. What is square law and give an example for a square law device Why FET is called as
24. Why FET is called as unipolar device?
25. Why the common-source (CS) amplifier may be viewed as a transconductance amplifier
26. What are the characteristics of JFET source amplifier?
27. What are the characteristics of JFET source amplifier?
28. What is the impedance of FET?
29. What is an amplifier?
30. If Q point is not properly selected, then what will be the effect on the output waveform?

EXERCISE:

1. Plot the frequency and amplitude response of FET BFW 10 amplifier with C_1 = 5 µF.
2. Plot the frequency response of FET BFW 10 amplifier with C_2 = 5 µF with triangular i/p.
3. Plot the amplitude response of FET BFW 10 amplifier with R_{G1} = 4.1 K.
4. Plot the amplitude response of FET BFW 10 amplifier with R_{G2} = 9.4 K triangular i/p.
5. Plot frequency response of BFW 10 amplifier R_{G1} = 4.1 K, R_{G2} = 9.4 K with square i/p.
6. Plot the frequency and amplitude response of FET BFW 11 amplifier with C_1 = 5 µF.
7. Plot the frequency response of P Channel JFET amplifier with C_2 = 5 µF, triangular i/p.
8. Plot the amplitude response of FET BFW 11 amplifier with R_{G1} = 4.1 K.
9. Plot the amplitude response of P Channel JFET amplifier with R_{G2} = 9.4 K triangular i/p.
10. Plot frequency response of P Channel JFET R_{G1} = 4.1 K, R_{G2} = 9.4 K with square i/p.
11. Plot the frequency and amplitude response of FET BFW 10 amplifier with C_1 = 10 µF.
12. Plot the frequency response of FET BFW 10 amplifier with C_2 = 2 µF with triangular i/p.
13. Plot the amplitude response of FET BFW 10 amplifier with R_{G1} = 2.1 K.
14. Plot the amplitude response of FET BFW 10 amplifier with R_{G2} = 5.4 K triangular i/p.
15. Plot frequency response of BFW 10 amplifier R_{G1} = 2.1 K, R_{G2} = 2.4 K with square i/p.
16. Plot the frequency and amplitude response of FET BFW 11 amplifier with C_1 = 2 µF.
17. Plot the frequency response of P Channel JFET amplifier with C_2 = 2 µF, triangular i/p.
18. Plot the amplitude response of FET BFW 11 amplifier with R_{G1} = 2.1 K.
19. Plot the amplitude response of P Channel JFET amplifier with R_{G2} = 2.4 K triangular i/p.
20. Plot frequency response of P Channel JFET R_{G1} = 2.1 K, R_{G2} = 9.4 K with square i/p.
21. Plot the frequency and amplitude response of FET BFW 10 amplifier with C_1 = 5 µF.
22. Plot the frequency response of FET BFW 10 amplifier with C_2 = 5 µF with triangular i/p.
23. Plot the amplitude response of FET BFW 10 amplifier with R_{G1} = 4.1 K.
24. Plot the amplitude response of FET BFW 10 amplifier with R_{G2} = 9.4 K triangular i/p.
25. Plot frequency response of BFW 10 amplifier R_{G1} = 4.1 K, R_{G2} = 9.4 K with square i/p.
26. Plot the frequency and amplitude response of FET BFW 11 amplifier with C_1 = 5 µF.
27. Plot the frequency response of P Channel JFET amplifier with C_2 = 5 µF, triangular i/p.
28. Plot the amplitude response of FET BFW 11 amplifier with R_{G1} = 4.1 K.
29. Plot the amplitude response of P Channel JFET amplifier with R_{G2} = 9.4 K triangular i/p.
30. Plot frequency response of P Channel JFET R_{G1} = 4.1 K, R_{G2} = 9.4 K with square i/p

EXPT NO: 3.B

COMMON SOURCE AMPLIFIER (Hardware)

AIM: -

1. Plot the frequency response of a FET amplifier in common source mode .
2. Calculate gain.
3. Calculate bandwidth.

COMPONENTS & EQUIPMENTS REQUIRED: -

S.No	Device	Range/Rating	QTY
1.	(a) DC supply voltage (b) FET (c) Capacitors (d) Resistors	12V BFW 11,BF245C 10 F 100 F 100 ,470 4.7K ,8.2k	1 1 2 1 1 1
2.	Signal generator	0.1Hz-1MHz	1
3.	CRO	0Hz-20MHz	1
4.	Connecting wires	5A	4

CIRCUIT DIAGRAM:

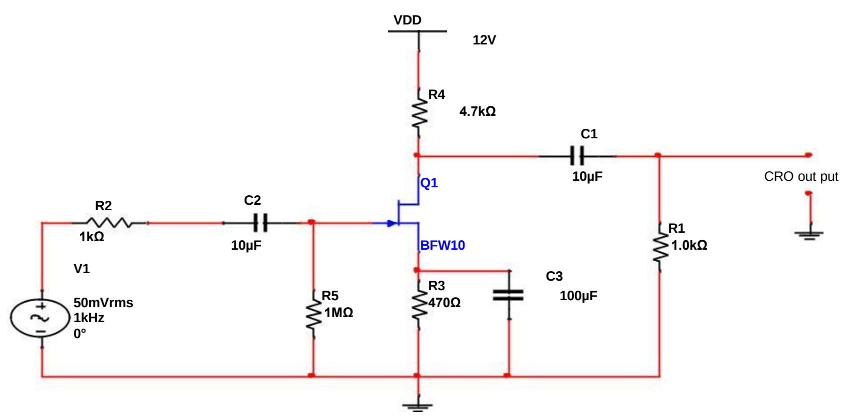


Fig: 3.b Common Source Amplifier circuit Dig

PROCEDURE: -

1. Connect the circuit diagram as shown in figure.
2. Adjust input signal amplitude 50mV, 1 KHz in the function generator and Observe an amplified voltage at the output without distortion.
3. By keeping input signal voltage, say at 50mV; vary the input signal frequency from 10 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.

PRECAUTIONS:

1. Avoid loose connections and give proper input Voltage

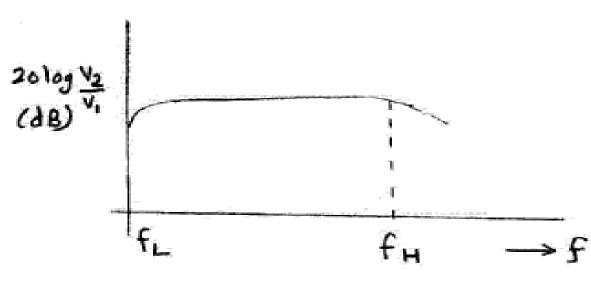
TABULAR COLUMN: **Input = 50mV**

Frequency(in Hz)	Output Voltage (V_o)	Gain $A_v=V_o/V_i$	Gain(in dB) $=20\log_{10}(V_o/V_i)$
10			
50			
100			
1K			
10k			
50K,100K			
200k,500K			
1M			

RESULT: -

1. Frequency response of FET Common source amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.

EXPECTED GRAPH:



EXPT NO: 4.A

TWO STAGE RC COUPLED AMPLIFIER (Software)

PRELAB:

1. Study the purpose of using multistage amplifiers.
2. Learn the different types of coupling methods.
3. Study the effect of cascading on Bandwidth.
4. Identify all the formulae you will need in this Lab.
5. Study the procedure of using Multisim tool (Schematic & Circuit File).

OBJECTIVE:

1. To simulate the Two Stage RC Coupled Amplifier in Multisim and study the transient and frequency response.
2. To determine the phase relationship between the input and output voltages by performing the transient analysis.
3. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of Two Stage RC Coupled Amplifier by performing the AC analysis.
4. To determine the effect of cascading on gain and bandwidth.

SOFTWARE TOOL:

Multisim

APPARATUS:

Regulated power supply	-	1 No.
1. Function generator	-	1 No.
2. CRO	-	1 No.
3. Transistor (BC 107 or 2N2222)	-	2 No.
4. Resistors (5KΩ,47 KΩ,2 KΩ, ,1 KΩ)	-	2 No. each
5. Resistor (10 KΩ)	-	4 Nos.
6. Capacitors (10 µF, 1 µF)	-	2,3No. each
7. Bread Board	-	1 No.
8. Connecting wires		

CIRCUIT DIAGRAM:

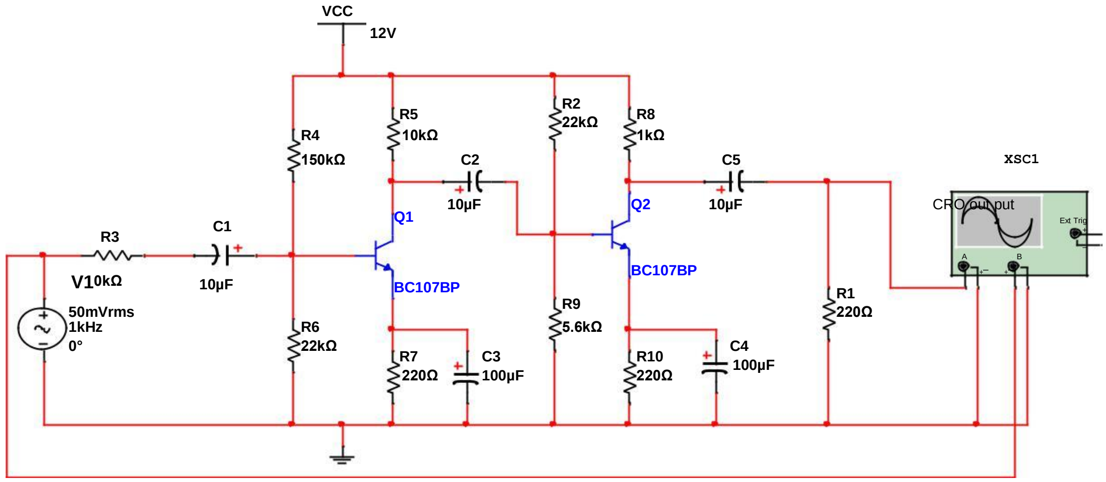


Fig: 4.a Two Stage RC Coupled Amplifier Circuit Diagram

THEORY:

An amplifier is the basic building block of most electronic systems. Just as one brick does not make a house, a single-stage amplifier is not sufficient to build a practical electronic system. The gain of the single stage is not sufficient for practical applications. The voltage level of a signal can be raised to the desired level if we use more than one stage. When a number of amplifier stages are used in succession (one after the other) it is called a multistage amplifier or a cascade amplifier. Much higher gains can be obtained from the multi-stage amplifiers. In a multi-stage amplifier, the output of one stage makes the input of the next stage. We must use a suitable coupling network between two stages so that a minimum loss of voltage occurs when the signal passes through this network to the next stage. Also, the dc voltage at the output of one stage should not be permitted to go to the input of the next. If it does, the biasing conditions of the next stage are disturbed.

Figure shows how to couple two stages of amplifiers using RC coupling scheme. This is the most widely used method. In this scheme, the signal developed across the collector resistor R_C (R2)of the first stage is coupled to the base of the second stage through the capacitor C_C.(C2) The coupling capacitor blocks the dc voltage of the first stage from reaching the base of the second stage. In this way, the dc biasing of the next stage is not interfered with. For this reason, the capacitor C_C (C2)is also called a blocking capacitor.

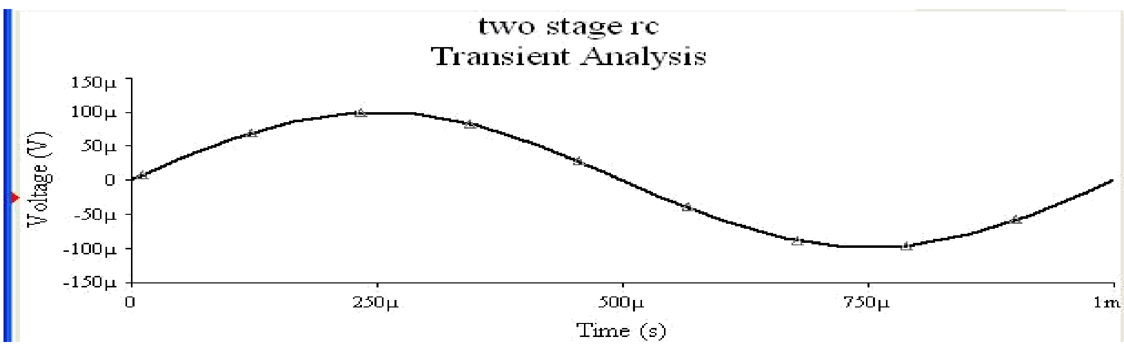
As the number of stages increases, the gain increases and the bandwidth decreases.
RC coupling scheme finds applications in almost all audio small-signal amplifiers used in record players, tape recorders, public-address systems, radio receivers, television receivers, etc.

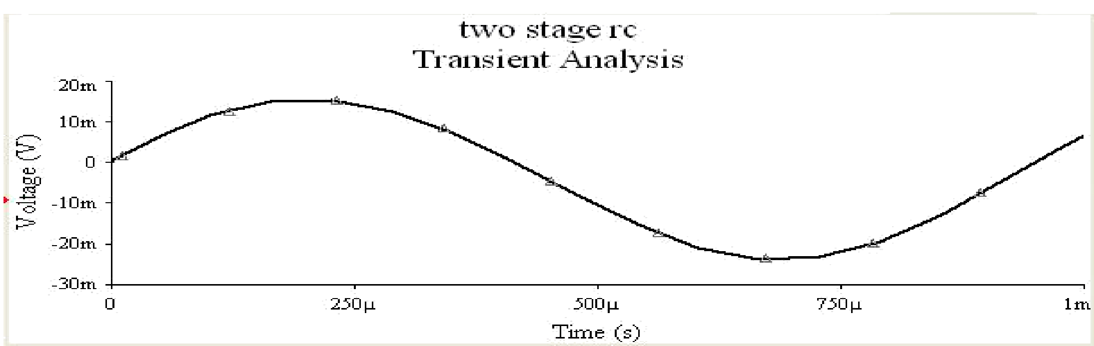
PROCEDURE:

1. Open Multisim Software to design Two stage RC coupled amplifier circuit
2. Select on New editor window and place the required component CS amplifier on the circuit window.
3. Make the connections using wire and check the connections and oscillator.
4. Go for simulation and using Run Key observe the output waveforms on CRO
5. Indicate the node names and go for AC Analysis with the output node
6. Observe the Transient response and Ac Analysis for the first stage and second stage separately and draw the magnitude response curve
7. Calculate the bandwidth of the amplifier

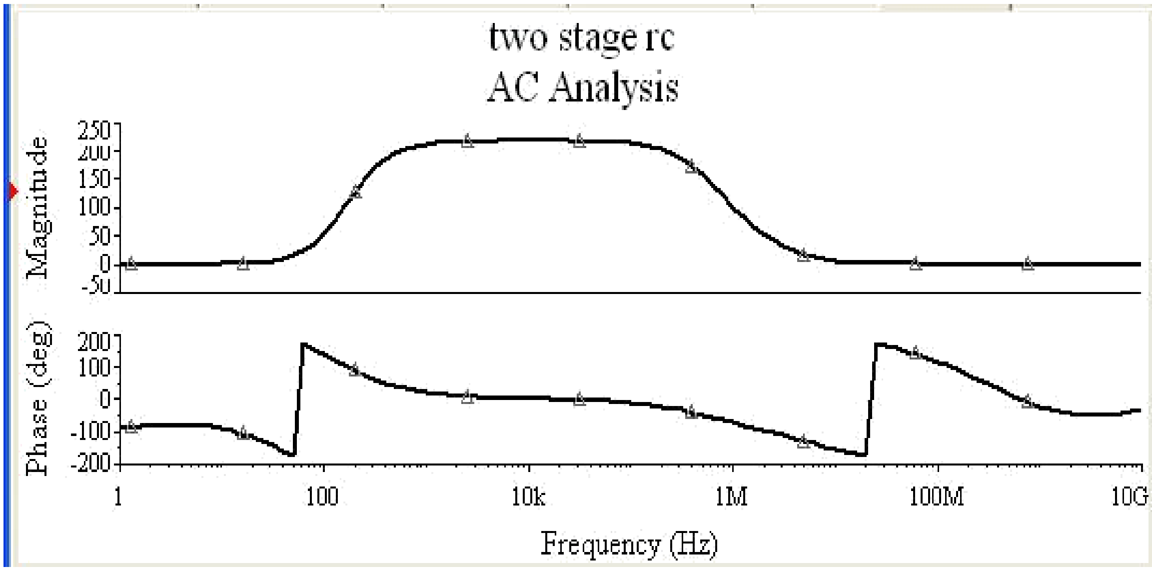
OBSERVATIONS/GRAPHS:

TRANSIENT RESPONSE:





FREQUENCY RESPONSE:



INFERENCE:

1. From the transient analysis, it is observed that,___________________________
2. From the frequency response curve the following results are calculated:
3. From the AC response, it is observed that, _____________________________

S. No.	Parameter	Value
1	Max. Gain in dB	
2	3dB Gain	
3	Lower Cutoff Frequency	
4	Upper Cutoff Frequency	
5	Bandwidth of I stage	
6	Bandwidth of 2 stage	

APPLICATIONS:

1. They are widely used as voltage amplifiers (ie. In the initial stages of public address systems) because of their excellent audio-fidelity over a wide range of frequency. However because of poor impedance matching this type of coupling transistor circuits is rarely employed in final stages impedance matching voltage amplifier in initial stage of public addressing system.

2. To increase the power gain, high input impedance, low output impedance, and increase the weaken signal.

3. To increase the power gain, high input impedance, low output impedance, and increase the weaken signal.

4. In a two stage RC coupled amplifier, the two transistors are identical and a common power supply is used. The input is provided to the first stage of the amplifier where it is amplified and this output is used as input for the second stage.

5. This is amplified once again by the other transistor in the second stage and the final output is obtained.

6. There will be a 180 degree phase shift after the first stage amplification which is nullified by the 180 degree phase shift of the second stage amplification. Thus, we obtain an output which is an amplified signal of the input and is in phase with the input signal.

VIVA QUESTIONS:

1. Why do you need more than one stage of amplifiers in practical circuits?
2. What is the effect of cascading on gain and bandwidth?
3. What happens to the 3dB frequencies if the number of stages of amplifiers increases?
4. Why we use a logarithmic scale to denote voltage or power gains, instead of using the simpler linear scale?
5. What is loading effect in multistage amplifiers?
6. What is the necessity of cascading?
7. What is 3dB bandwidth?
8. Why RC coupling is preferred in audio range?
9. Which type of coupling is preferred and why?
10. Explain various types of Capacitors?
11. What is loading effect?
12. Why it is known as RC coupling?
13. What is the purpose of emitter bypass capacitor?
14. Which type of biasing is used in RC coupled amplifier?
15. What is difference between Amplifier and Attenuator?
16. Which Amplifier will amplify voltage and current?
17. What are the advantages over single stage amplifier?
18. What are the classifications of multistage amplifiers?
19. What are the different BJT multistage amplifier configurations?
20. Define cut off frequency?
21. What Is the pin configuration on bread board used in the lab?
22. What is two stages RC coupled amplifier?
23. Which type of coupling is preferred and why?
24. Explain various types of Capacitors?
25. What is loading effect?
26. Why it is known as RC coupling?
27. What is the purpose of emitter bypass capacitor?
28. Which type of biasing is used in RC coupled amplifier?

30. What is two stages RC coupled amplifier?

EXERCISE PROBLEMS:

1. Plot the frequency response of BC 107 amplifier with C_1 = 5 μF.
2. Plot the frequency response of BC 547 amplifier with C_2 = 5 μF with i/p.
3. Plot the frequency response of BC 2N2222 amplifier with R_1 = 4.1 K.
4. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
7. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
8. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the frequency response of BC107 amplifier with R_2 = 9.4 K i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 μF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 μF with i/p.
13. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the frequency response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 μF.
17. Plot the frequency response of amplifier with C_2 = 2 μF, i/p.
18. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the frequency response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency response of BC 107 amplifier with C_1 = 5 μF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 μF with i/p.
23. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the frequency response BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
27. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
28. Plot the frequency response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 4.B

TWO STAGE RC COUPLED AMPLIFIER (Hardware)

AIM: -

1. Plot the frequency response of a Two Stage Amplifier.
2. Calculate gain.
3. Calculate bandwidth.

COMPONENTS & EQUIPMENTS REQUIRED: -

S.No	Device	Range/Rating	QTY
1.	(a) DC supply voltage (b) Transistor (c) Capacitors (d) Resistors	12V BC107 10 F 100 F 100 ,470 4.7K ,8.2k	1 1 2 1 1 1
2.	Signal generator	0.1Hz-1MHz	1
3.	CRO	0Hz-20MHz	1
4.	Connecting wires	5A	4

CIRCUIT DIAGRAM:

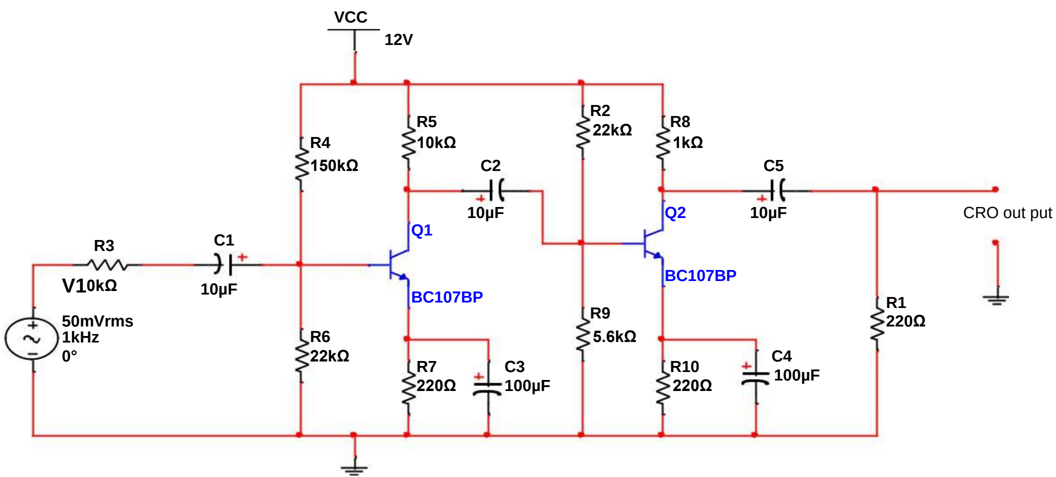


Fig: 4.b Two Stages RC coupled amplifier circuit

PROCEDURE: -

1. Connect the circuit diagram as shown in figure.
2. Adjust input signal amplitude in the function generator and observe an amplified voltage at the output without distortion.
3. By keeping input signal voltage, say at 50mV, vary the input signal frequency from 0 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.

PRECAUTIONS:

Avoid loose connections and give proper input Voltage

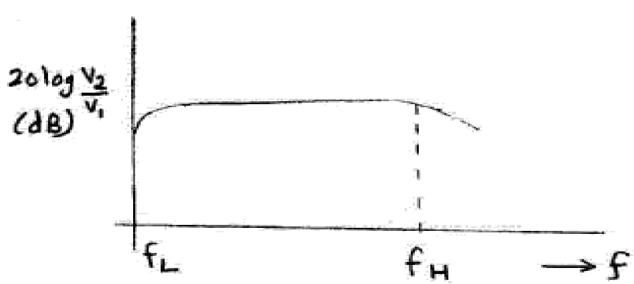
TABULAR COLUMN: **Input = 50mV**

Frequency(in Hz)	Output Voltage (V_o)		Gain $A_v=V_o/V_i$		Gain(in dB) $=20\log_{10}(V_o/V_i)$	
	With feedback	Without feedback	With feedback	Without feedback	With feedback	Without feedback
20						
40						
80						
100						
1K						
10k						
50k,100K						
1M						

RESULT: -

1. Frequency response of Two stage RC coupled amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz. At stage I
4. Bandwidth= f_H-f_L = _________Hz. At stage 2

EXPECTED GRAPH:



EXPT NO: 5.A

CURRENT SHUNT FEED BACK AMPLIFIER (SOFTWARE)

AIM: -

1. Study the concept of feedback in amplifiers.
2. Study the characteristics of current shunt feedback amplifier.
3. Identify all the formulae will need in this experiment.
4. Analyze the circuit using Multisim

OBJECTIVE:

1. To simulate the Current Shunt Feedback Amplifier in Multisim and study the transient and frequency response.
2. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of Current Shunt Feedback Amplifier by performing the AC analysis.
3. To determine the effect of feedback on gain and bandwidth and compare with Multisim results.

REQUIREMENTS:

1. Transistor – 2n2222(2)
2. Resistors – as per circuit diagram
3. Capacitors – as per circuit diagram
4. RPS – 0-30V.
5. CRO.
6. Breadboard.
7. Connecting wires and Probes.

CIRCUIT DIAGRAM:

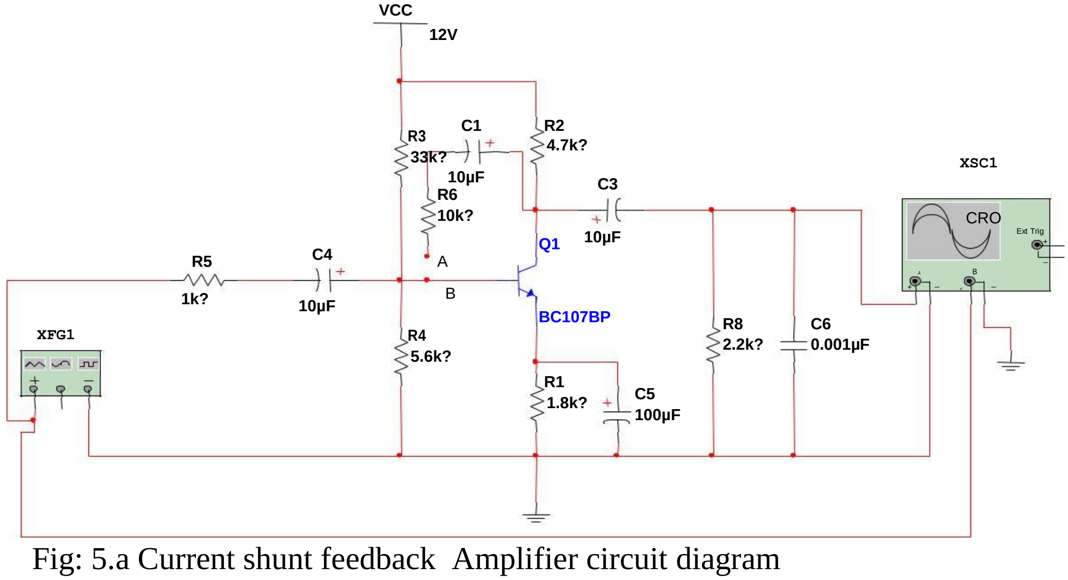


Fig: 5.a Current shunt feedback Amplifier circuit diagram

THEORY:

Feedback plays a very important role in electronic circuits and the basic parameters, such as input impedance, output impedance, current and voltage gain and bandwidth, may be altered considerably by the use of feedback for a given amplifier.

A portion of the output signal is taken from the output of the amplifier and is combined with the normal input signal and thereby the feedback is accomplished.

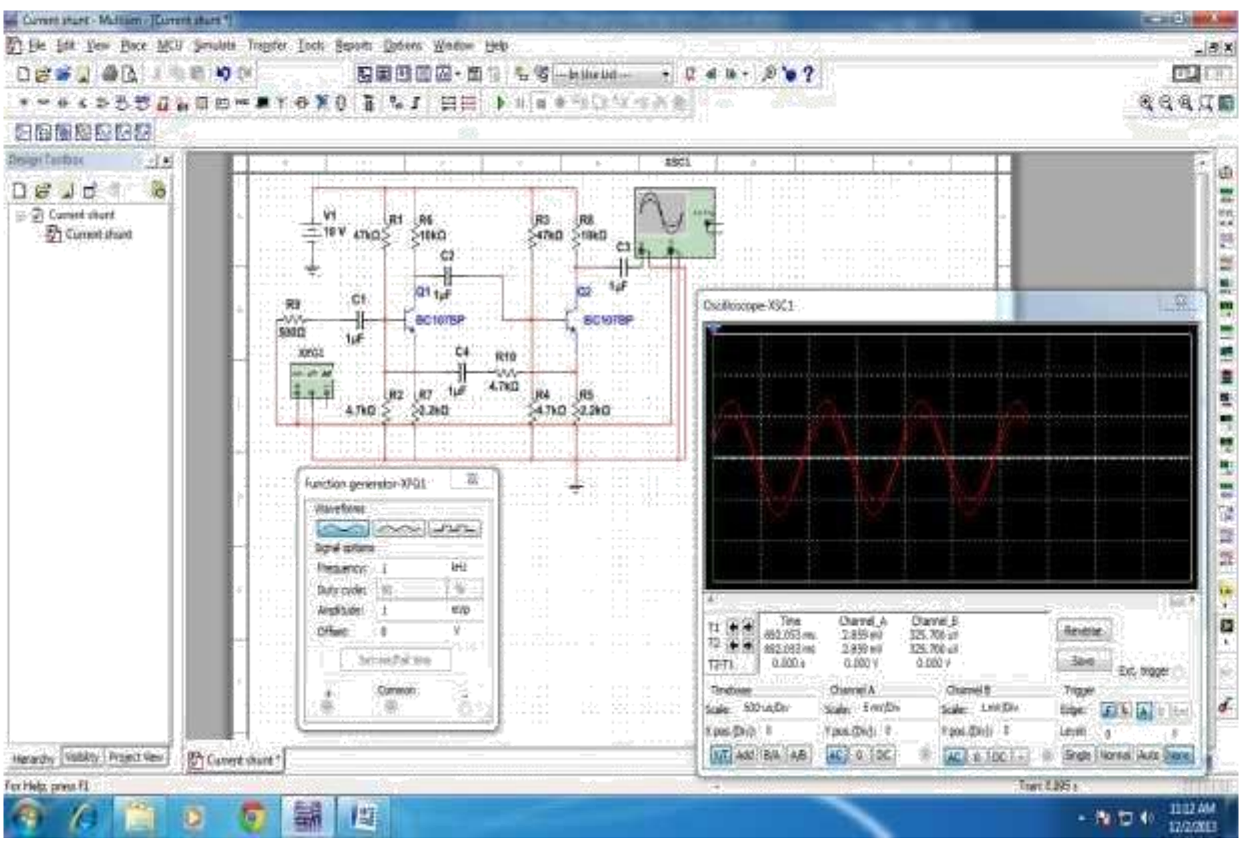
There are two types of feedback. They are i) Positive feedback and ii) Negative feedback. Negative feedback helps to increase the bandwidth, decrease gain, distortion, and noise, modify input and output resistances as desired.

A current shunt feedback amplifier circuit is illustrated in the figure. It is called a series-derived, shunt-fed feedback. The shunt connection at the input reduces the input resistance and the series connection at the output increases the output resistance. This is a true current amplifier.

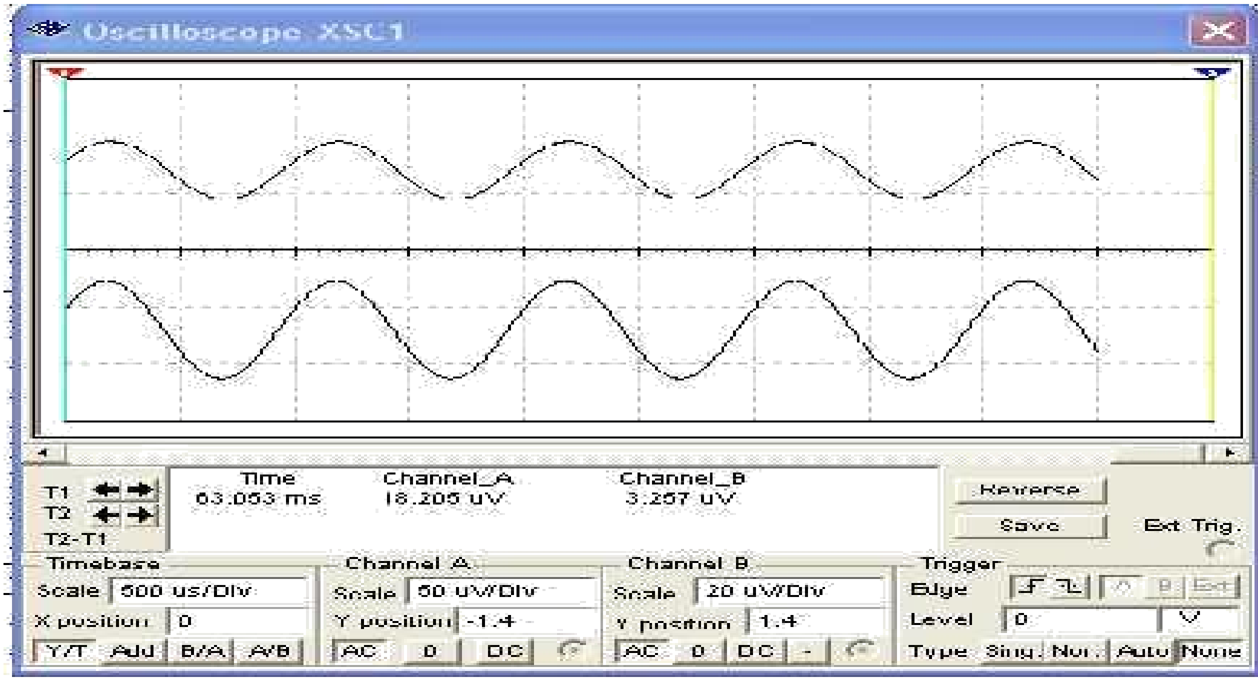
PROCEDURE:

1. Connect the circuit as per the circuit diagram.
2. Apply the input signal.
3. Vary the frequency conveniently and note down the output voltage.
4. Plot the curve between gain and resonant frequency.
5. Calculate the gain.
6. Calculate the resonant frequency and compare it with the theoretical value.

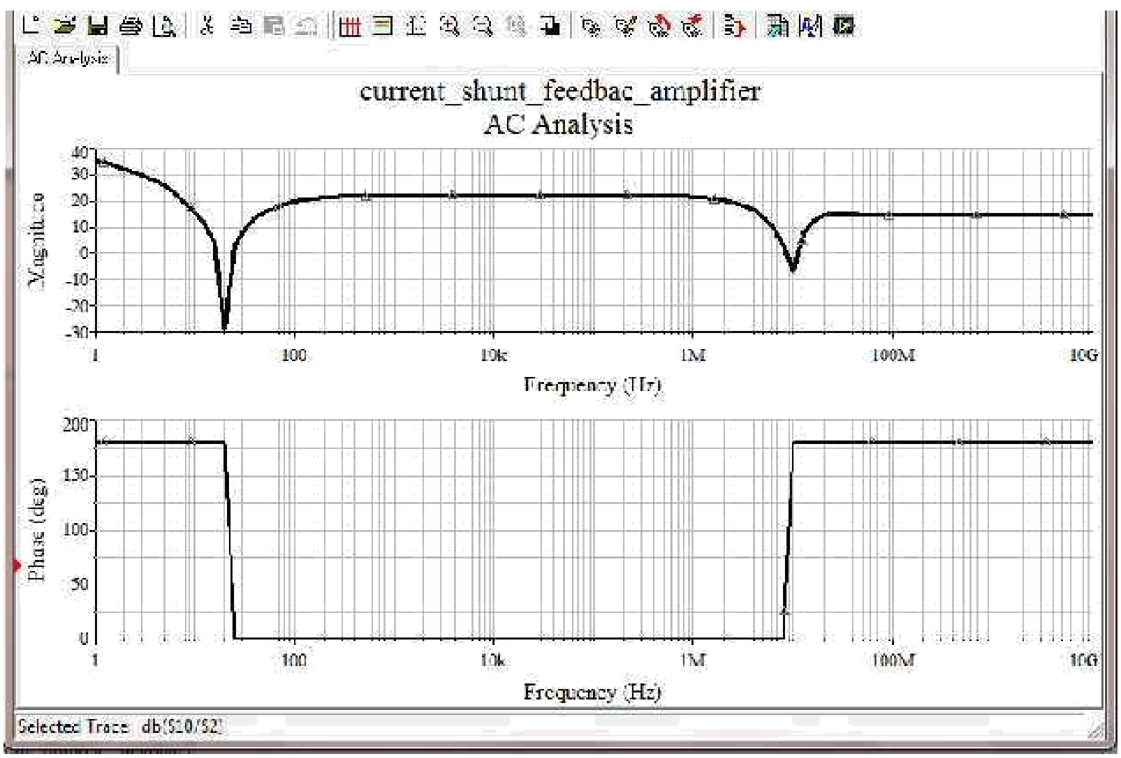
Observations/Graphs:



i) Transient Response:



ii) Frequency Response:



Inference:

1. From the frequency response curve the following results are calculated:

S. No.	Parameter	Value
1	Max. Gain in dB	
2	3dB Gain	

2. From the AC response, it is observed that, ______________________________.

VIVA QUESTIONS:

1. State the merits and demerits of negative feedback in amplifiers.
2. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open circuited, what happens to the gain of the amplifier? Explain.
3. When will a negative feedback amplifier circuit be unstable?
4. What is the parameter which does not change with feedback?
5. What type of feedback has been used in an emitter follower circuit?
6. Define Current shunt feedback amplifier?
7. Draw the current shunt feedback amplifier?
8. When will a negative feedback amplifier circuit be unstable?
9. What is the parameter which does not change with feedback?
10. What type of feedback has been used in an emitter follower circuit?
11. Transistor when it is working as an amplifier?
12. Why frequency response of the amplifier is drawn on semi-log scale graph?
13. If Q point is not properly selected, then what will be the effect on the output waveform?
14. What is active region?
15. Why is common base configuration used as current buffer even though it has properties of current amplifier?
16. What does the current shunt feedback amplifier amplify? And how?
17. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open circuited, what happens to the gain of the amplifier? Explain.
18. When will a negative feedback amplifier circuit be unstable?
19. What is the parameter which does not change with feedback?
20. Transistor when it is working as an amplifier?
21. Why frequency response of the amplifier is drawn on semi-log scale graph?
22. If Q point is not properly selected, then what will be the effect on the output waveform?
23. What is active region?
24. What is Bandwidth of an amplifier?
25. Why is common base configuration used as current buffer even though it has properties of current amplifier?
26. State the merits and demerits of negative feedback in amplifiers.
27. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open circuited,
28. What happens to the gain of the amplifier? Explain.
29. Define Current shunt feedback amplifier?
30. What is Bandwidth of an amplifier?

APPLICATIONS:

1. Voltage series feedback (Af= Vo/Vs) –Voltage amplifier
2. Voltage shunt feedback (Af= Vo/Is) –Trans-resistance amplifier
3. Current series feedback (Af= Io/Vs) -Trans-conductance amplifier
4. Current shunt feedback (Af= Io/Is) -Current amplifier

EXERCISE PROBLEMS:

1. Plot the frequency response of BC 107 amplifier with C_1 = 5 µF.
2. Plot the frequency response of BC 547 amplifier with C_2 = 5 µF with i/p.
3. Plot the frequency response of BC 2N2222 amplifier with R_1 = 4.1 K.
4. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
7. Plot the frequency response of amplifier with C_2 = 5 µF, i/p.
8. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the frequency response of BC107 amplifier with R_2 = 9.4 K i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 µF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 µF with i/p.
13. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the frequency response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 µF.
17. Plot the frequency response of amplifier with C_2 = 2 µF, i/p.
18. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the frequency response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency response of BC 107 amplifier with C_1 = 5 µF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 µF with i/p.
23. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the frequency response BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
27. Plot the frequency response of amplifier with C_2 = 5 µF, i/p.
28. Plot the frequency response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. .Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 5.B

CURRENT SHUNT FEED BACK AMPLIFIER (HARDWARE)

AIM: -

1. Study the concept of feedback in amplifiers.
2. Study the characteristics of current shunt feedback amplifier.
3. Identify all the formulae will need in this experiment.

OBJECTIVE:

1. To simulate the Current Shunt Feedback Amplifier in Multisim and study the transient and frequency response.
2. To determine the maximum gain, 3dB gain, lower and upper cutoff frequencies and bandwidth of Current Shunt Feedback Amplifier by performing the AC analysis.
3. To determine the effect of feedback on gain and bandwidth and compare with Multisim results.

REQUIREMENTS:

1. Transistor – 2n2222(2)
2. Resistors – as per circuit diagram
3. Capacitors – as per circuit diagram
4. RPS – 0-30V.
5. CRO.
6. Breadboard.
7. Connecting wires and Probes.

CIRCUIT DIAGRAM:

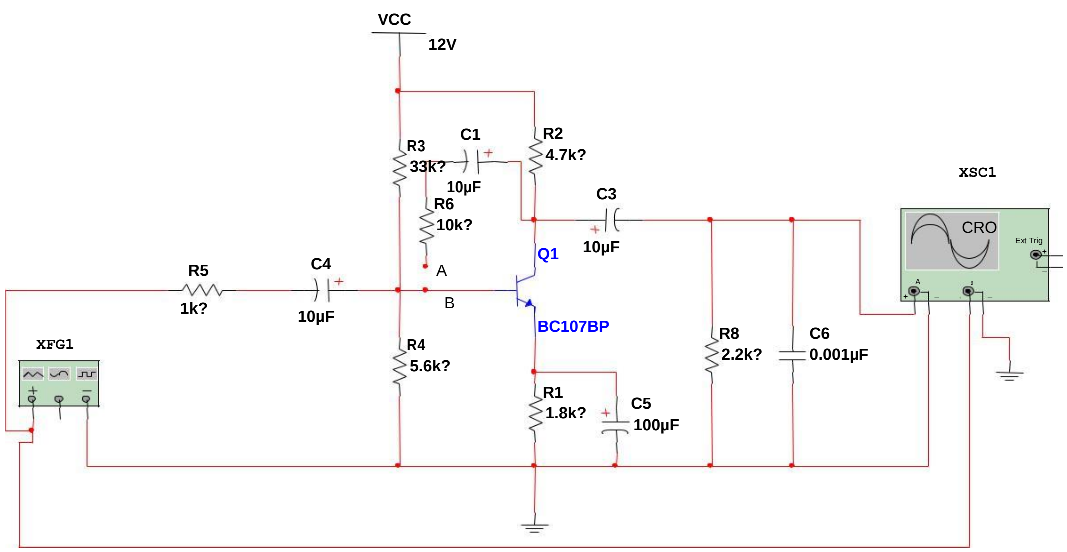


Fig: 5.a Current shunt feedback Amplifier circuit diagram

THEORY:

Feedback plays a very important role in electronic circuits and the basic parameters, such as input impedance, output impedance, current and voltage gain and bandwidth, may be altered considerably by the use of feedback for a given amplifier.

A portion of the output signal is taken from the output of the amplifier and is combined with the normal input signal and thereby the feedback is accomplished.

There are two types of feedback. They are i) Positive feedback and ii) Negative feedback. Negative feedback helps to increase the bandwidth, decrease gain, distortion, and noise, modify input and output resistances as desired.

A current shunt feedback amplifier circuit is illustrated in the figure. It is called a series-derived, shunt-fed feedback. The shunt connection at the input reduces the input resistance and the series connection at the output increases the output resistance. This is a true current amplifier.

PROCEDURE:

1. Connect the circuit as per the circuit diagram.
2. Apply the input signal.
3. Vary the frequency conveniently and note down the output voltage.
4. Plot the curve between gain and resonant frequency.
5. Calculate the gain.
6. Calculate the resonant frequency and compare it with the theoretical value.

RESULT: -

1. Frequency response of Current shunt amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.

EXPT NO: 6.A

VOLTAGE SERIES FEED BACK AMPLIFIER (SOFTWARE)

AIM: To design a voltage series feedback amplifier with following specifications and to study the frequency response of amplifier, calculate voltage gain and bandwidth from the response.

DESIGN SPECIFICATIONS:

$A_{Vf} = 0.995$, $h_{fe} = 125$, $R_i' = 50$ KΩ, $V_{CC} = 12$V, $h_{ie} = 2.2$ KΩ, $I_C = 1.5$ mA, $V_{CE} = 6$ V

SOFTWARE USED:

Multisim V 13.0

CIRCUIT DIAGRAM:

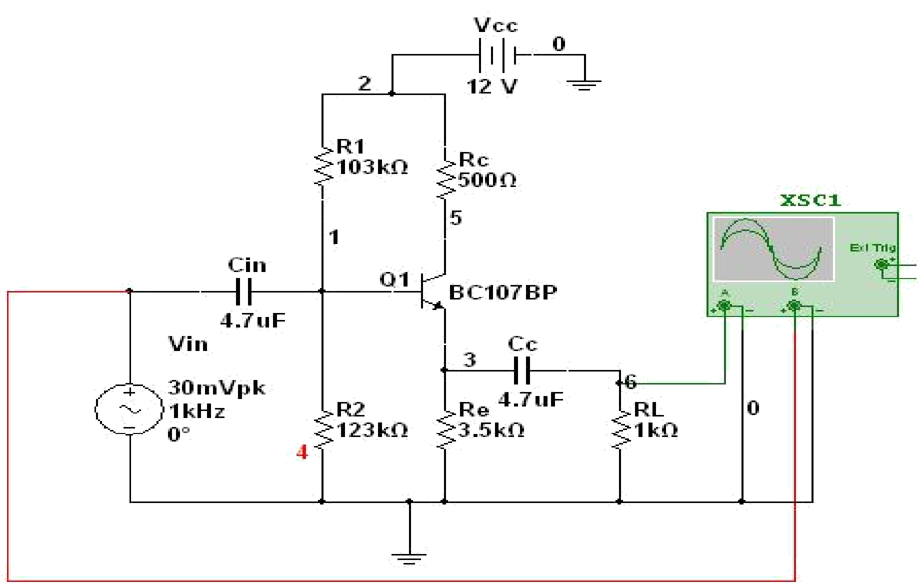


Fig: 6.a Voltage series feedback Amplifier circuit diagram

DESIGN PROCEDURE:

i.Determine the R_E using $$A_V \quad \frac{h_{fe} \; xR_E}{R_S \, h_{ie}} \quad \frac{h_{fe} \; xR_E}{h_{ie}}$$

A_V is calculated as follows

$$A_{Vf} \quad \frac{A_V}{1A_V} \quad \frac{A_V}{1A_V} \qquad (1)$$

$A_{Vf}\ (1 + A_V) = A_V$

$A_{Vf} + A_{Vf}\ A_V = A_V$

$A_V(1 - A_{Vf}) = A_{Vf}$

$$A_V \quad \frac{A_{Vf}}{1 \quad A_{Vf}}$$

$$A_V \quad \frac{0.995}{10.995} \; 199$$

$$R_E \quad \frac{A_V \; xh_{ie}}{h_{fe}}$$

$$R_E \quad \frac{199x(22x10^3)}{125} \; 3502.4$$

$R_E = 3.5\ K\Omega$

ii. Determine the R_C by applying KVL around output loop

$V_{CC} = I_C R_C + V_{CE} + I_C R_E$

$V_{CC} = V_{CE} + I_C (R_C + R_E)$

$12 = 6 + (1.5 \times 10^{-3}) [R_C + 3.5 \times 10^{-}$

$^{3}] R_C = 0.5 K\Omega$

iii. Determine the R_1 and R_2 as follows

R_1 is calculated using $V_{BB} \quad \frac{R_B}{R_1}$

$$R_1 \quad \frac{V_{CC} \, x R_B}{V_{BB}}$$

R_B is calculated as follows

Let we know that

$R_I{}' \quad R_B | R_{If}$

$R_{If} = h_{ie} + h_{fe} \times R_E$

$R_{If} = (22 \times 10^3) + (125 \times 3.5 \times 10^3)$

$R_{If} = 439.7 K\Omega$

$R_I{}' \quad R_B | R_{If}$

$$50K \quad \frac{R_B \, x R_{If}}{R_B \quad R_{If}}$$

$R_B = 56.41 K\Omega$

V_{BB} is calculated by applying KVL around input loop

$V_{BB} = V_{BE} + I_B R_B + I_E R_E$

$V_{BB} = 0.6 + 0.676 + 5.25 = 6.52$ V

$V_{BB} = 6.52$ V

$$R_1 \quad \frac{V_{CC} \, x R_B}{V_{BB}}$$

$$R_1 \quad \frac{(12)x(56.41x10^{3})}{} \quad 103.82K$$

$R_1 = 103.82$ KΩ

$$R_B = \frac{R_1 \; R_2}{R_1 \quad R_2}$$

$R_2 = 123.59$KΩ

$R_1 = 103.82$ KΩ, $R_2 = 123.59$ KΩ, $R_C = 0.5$ KΩ, $R_E = 3.5$ KΩ

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the function generator with sine wave of 50 mV p-p as input at the input of terminals of the circuit.
5. Connect the Cathode Ray Oscilloscope (CRO) to the out put terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. From the CRO note the following values
    1. Input voltage V_i =
    2. Output voltage V_0 =
    3. Voltage gain $A_V = V_0/V_i$ =
    4. Phase shift θ =
8. To study the frequency response click the AC analysis, so that a screen displays the following options
    1. Start frequency
    2. Stop frequency
    3. Vertical scale
9. Assign the proper values for start frequency, stop frequency and vertical scale according to the circuit requirements and observe the frequency response.
10. From the frequency response calculate the

    maximum gain A_{Vmax} =

    lower cutoff frequency (f1) at A_{Vmax} - 3dB (decibel scale) value

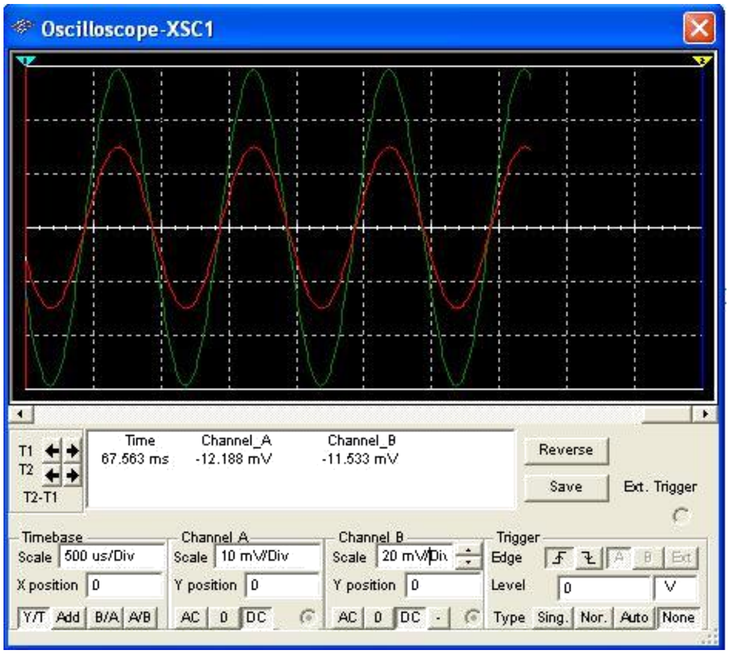
    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

    Higher cutoff frequency (f2) at A_{Vmax} - 3dB (decibel scale) value

    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

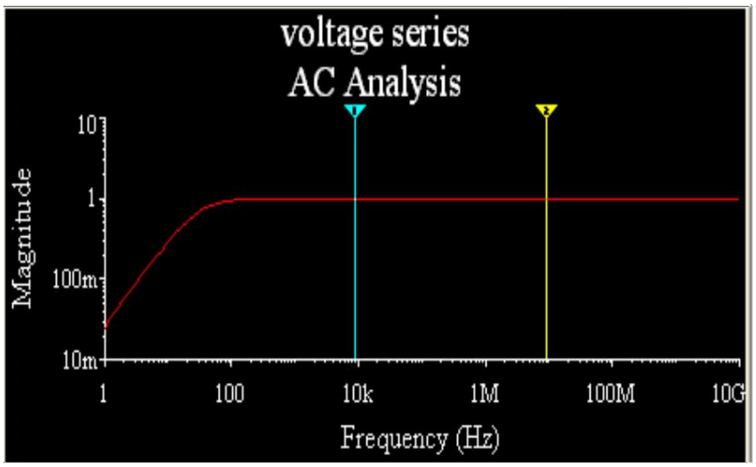
OBSERVATIONS:

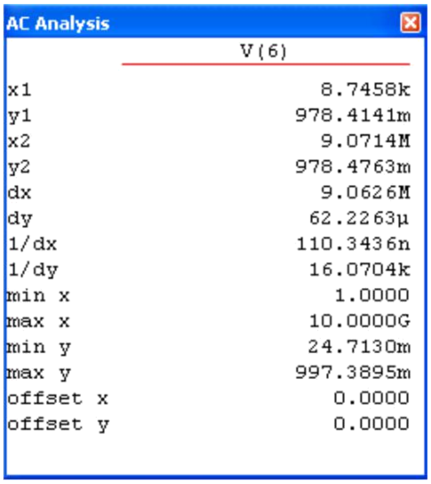
From CRO:



1. Input voltage V_i =
2. Output voltage V_0 =
3. Voltage gain $A_V = V_0/V_i$ =
4. Phase shift θ =

From Frequency response:





1. Maximum gain A_{Vmax} =
2. Lower cutoff frequency(f1) at A_{Vmax}-3dB (decibel scale) value
   at $A_{Vmax}/\sqrt{2}$ (linear scale) =
3. Higher cutoff frequency(f2) at A_{Vmax}-3dB (decibel scale)
   value at $A_{Vmax}/\sqrt{2}$ (linear scale) =

RESULT: -

1. Frequency response of Voltage Series Feed Back amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = ______

APPLICATIONS:

1. Voltage series feedback (Af= Vo/Vs) –Voltage amplifier
2. Voltage shunt feedback (Af= Vo/Is) –Trans-resistance amplifier
3. Current series feedback (Af= Io/Vs) -Trans-conductance amplifier
4. Current shunt feedback (Af= Io/Is) -Current amplifier

EXERCISE PROBLEMS:

1. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
2. Plot the frequency response of BC 107amplifier with C_2 = 5 μF with triangular i/p.
3. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
4. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K triangular i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with square i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
7. Plot the frequency response of amplifier with C_2 = 5 μF, triangular i/p.
8. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the amplitude response of BC107 amplifier with R_2 = 9.4 K triangular i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with square i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 μF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 μF with i/p.
13. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the amplitude response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 μF.
17. Plot the frequency response of amplifier with C_2 = 2 μF, i/p.
18. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the amplitude response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 μF with i/p.
23. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
27. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
28. Plot the amplitude response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. Plot frequency response of R1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 6.B

VOLTAGE SERIES FEED BACK AMPLIFIER (HARDWARE)

AIM: To design a voltage series feedback amplifier with following specifications and to study the frequency response of amplifier, calculate voltage gain and bandwidth from the response.

CIRCUIT DIAGRAM:

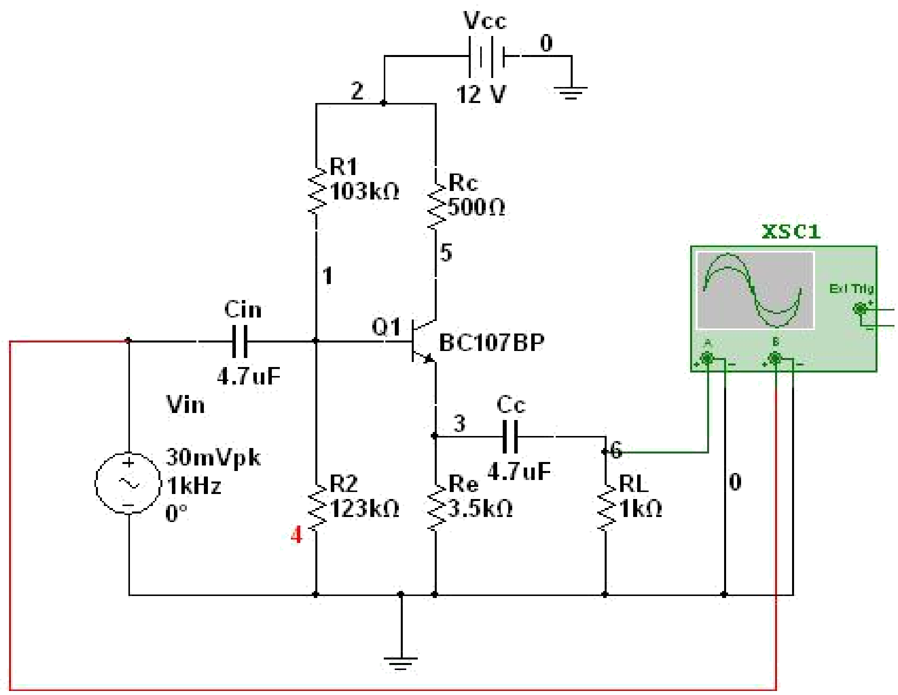


Fig: 6.a Current shunt feedback Amplifier circuit diagram

DESIGN PROCEDURE:

iv.Determine the R_E using $A_V = \frac{h_{fe} x R_E}{R_S + h_{ie}} \approx \frac{h_{fe} x R_E}{h_{ie}}$

A_V is calculated as follows

$$A_{Vf} = \frac{A_V}{1 + A_V} \approx \frac{A_V}{1 + A_V} \qquad (1)$$

A_{Vf} (1 + A_V) = A_V

A_{Vf} + A_{Vf} A_V = A_V

A_V(1 - A_{Vf}) = A_{Vf}

$$A_V = \frac{A_{Vf}}{1 - A_{Vf}}$$

$$A_V = \frac{0.995}{1 - 0.995} = 199$$

$$R_E = \frac{A_V x h_{ie}}{h_{fe}}$$

$$R_E = \frac{199x(22x10^3)}{125} = 3502.4$$

R_E = 3.5 KΩ

v. Determine the R_C by applying KVL around output loop

$V_{CC} = I_C R_C + V_{CE} + I_C R_E$

$V_{CC} = V_{CE} + I_C (R_C + R_E)$

$12 = 6 + (1.5 \times 10^{-3}) [R_C + 3.5 \times 10^{-3}]$ $R_C = 0.5\ K\Omega$

vi. Determine the R_1 and R_2 as follows

R_1 is calculated using $V_{BB} \quad \frac{R_B}{R_1}$

$$R_1 \quad \frac{V_{CC}\ x R_B}{V_{BB}}$$

R_B is calculated as follows

Let we know that

$$R_I ' \quad R_B | R_{If}$$

$R_{If} = h_{ie} + h_{fe} \times R_E$

$R_{If} = (22 \times 10^3) + (125 \times 3.5 \times 10^3)$

$R_{If} = 439.7\ K\Omega$

$$R_I ' \quad R_B | R_{If}$$

$$50K \quad \frac{R_B\ x R_{If}}{R_B \quad R_{If}}$$

$R_B = 56.41\ K\Omega$

V_{BB} is calculated by applying KVL around input loop

$V_{BB} = V_{BE} + I_B R_B + I_E R_E$

$V_{BB} = 0.6 + 0.676 + 5.25 = 6.52$ V

$V_{BB} = 6.52$ V

$$R_1 \quad \frac{V_{CC} x R_B}{V_{BB}}$$

$$R_1 \quad \frac{(12)x(56.41x10^3)}{6.52} \; 103.82K$$

$R_1 = 103.82$ KΩ

$$R_B = \frac{R_1 \; R_2}{R_1 \quad R_2}$$

R_2=123.59KΩ

$R_1 = 103.82$ KΩ, $R_2 = 123.59$ KΩ, $R_C = 0.5$ KΩ, $R_E = 3.5$ KΩ

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the function generator with sine wave of 50 mV p-p as input at the input of terminals of the circuit.
5. Connect the Cathode Ray Oscilloscope (CRO) to the out put terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. From the CRO note the following values
    a. Input voltage V_i =
    b. Output voltage V_0 =
    c. Voltage gain $A_V = V_0/V_i$ =
    d. Phase shift θ =

8. To study the frequency response click the AC analysis, so that a screen displays the following options
    a. Start frequency
    b. Stop frequency
    c. Vertical scale
9. Assign the proper values for start frequency, stop frequency and vertical scale according to the circuit requirements and observe the frequency response.
10. From the frequency response calculate the
    a. maximum gain A_{Vmax} =

    b. lower cutoff frequency (f1) at A_{Vmax} - 3dB (decibel scale) value

       a. at $A_{Vmax}/\sqrt{2}$ (linear scale) =

    c. Higher cutoff frequency (f2) at A_{Vmax} - 3dB (decibel scale) value

RESULT: -

1. Frequency response of Voltage Series Feed Back amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.

VIVA QUESTIONS:

1. State the merits and demerits of negative feedback in amplifiers.
2. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open circuited, what happens to the gain of the amplifier? Explain.
3. When will a negative feedback amplifier circuit be unstable?
4. What is the parameter which does not change with feedback?
5. What type of feedback has been used in an emitter follower circuit?
6. Define voltage series feedback amplifier?
7. Draw the voltage series feedback amplifier?
8. When will a negative feedback amplifier circuit be unstable?
9. What is the parameter which does not change with feedback?
10. What type of feedback has been used in an emitter follower circuit?
11. Transistor when it is working as an amplifier?
12. Why frequency response of the amplifier is drawn on semi-log scale graph?
13. If Q point is not properly selected, then what will be the effect on the output waveform?
14. What is active region?
15. Why is common base configuration used as current buffer even though it has properties of current amplifier?
16. What does the current shunt feedback amplifier amplify? And how?
17. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open circuited,
18. What happens to the gain of the amplifier? Explain.
19. When will a negative feedback amplifier circuit be unstable?
20. What is the parameter which does not change with feedback?
21. Transistor when it is working as an amplifier?
22. Why frequency response of the amplifier is drawn on semi-log scale graph?
23. If Q point is not properly selected, then what will be the effect on the output waveform?
24. What is active region?
25. What is Bandwidth of an amplifier?
26. Why is common base configuration used as current buffer even though it has properties of current amplifier?
27. State the merits and demerits of negative feedback in amplifiers.
28. If the bypass capacitor C_E in an RC coupled amplifier becomes accidentally open Circuited, what happens to the gain of the amplifier? Explain.
29. Define voltage series feedback amplifier?
30. What is Bandwidth of an amplifier?

EXPT NO: 7.A

CASCODE AMPLIFIER (Software)

AIM: To design a Cascode amplifier with following specifications and to study the frequency response of amplifier, calculate voltage gain and bandwidth from the response.

DESIGN SPECIFICATIONS:

V_{CC} = 15 V, $I_{E1} = I_{E2}$ = 1 mA, A_{VT} = 100, f = 1 K Hz, R_C = 4.7 KΩ,

$\beta_1 = \beta_2 = 100$

SOFTWARE USED: Multisim V13.0

CIRCUIT DIAGRAM:

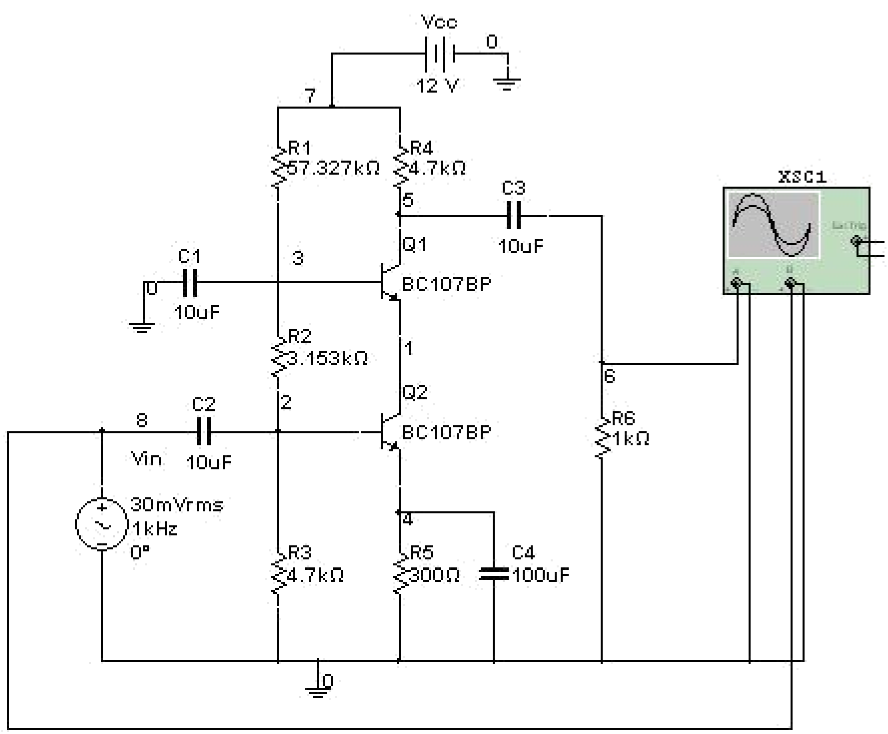


Fig: 7.a Cascode Amplifier circuit diagram

DESIGN PROCEDURE:

Calculation of R_E

Applying KVL to output loop

$V_{CC} = I_C R_C + V_{CE2} + V_{CE1} + I_E R_E$

$V_{CE1} = V_{CE2} \leq V_{CC}/3 = 15/3 = 5$ V

$I_C = I_{E1} = 1$ mA

$R_E =$ ______________Ω

Calculation of R_1 and R_2

$\beta_1 = \beta_2 = 100$

$I_C =$

I_B

I_B $\qquad$ I_C $\quad$ 10^{3}

100

$I_B =$µA

I_3 $\qquad$ V_{B1}

R_3

$V_{B1} = V_{BE2} + V_{E1}$

$= 0.7 + I_E R_E$

$V_{B1} =$ _______________ V

$I_3 =$ ________________ mA

$I_2 = I_{B1} + I_3$

$I_2 =$__________ mA

$$I_2 = \frac{V_{B2} - V_{B1}}{R_2}$$

Where $V_{B2} = V_{BE2} + V_{E1}$

V_{B2} = ________ V

R_2 =__________ Ω

$I_1 = I_{B2} + I_2$

I_1 =__________ A

$$R_1 = \frac{V_{CC} - V_{B2}}{I_1}$$

R_1 = ___________ Ω

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the function generator with sine wave of 50mVp-p as input at the input of terminals of the circuit.
5. Connect the Cathode Ray Oscilloscope (CRO) to the out put terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. From the CRO note the following values
   1. Input voltage V_i =
   2. Output voltage V_0 =
   3. Voltage gain $A_V = V_0/V_i$ =
   4. Phase shift θ =
8. To study the frequency response click the AC analysis, so that a screen displays the following options
   1. Start frequency
   2. Stop frequency

3. Vertical scale

9. Assign the proper values for start frequency, stop frequency and vertical scale according to the circuit requirements and observe the frequency response.
10. From the frequency response calculate the

    maximum gain A_{Vmax} =

    lower cutoff frequency (f1) at A_{Vmax}-3dB (decibel scale) value

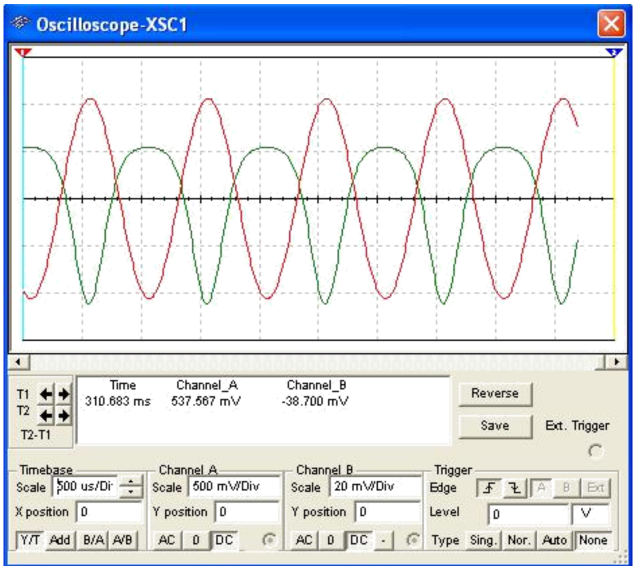
    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

    Higher cutoff frequency (f2) at A_{Vmax}-3dB (decibel scale) value

    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

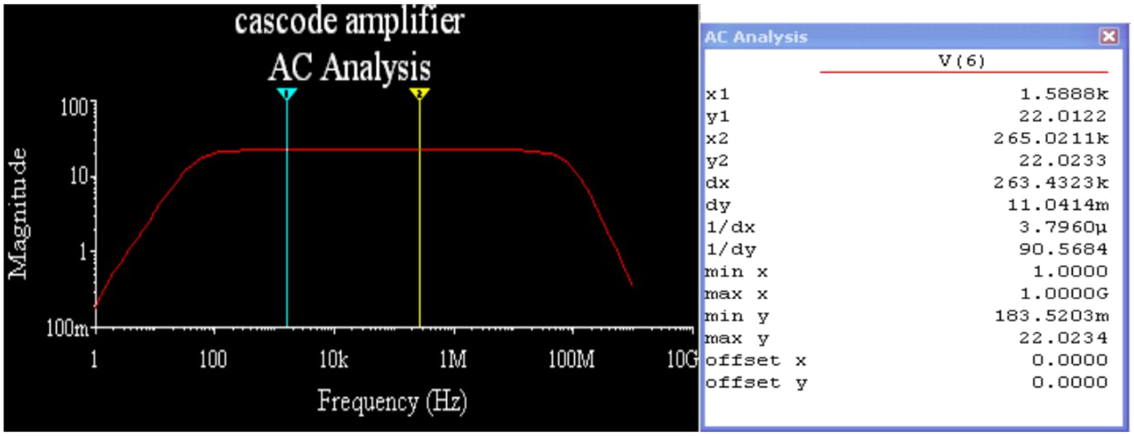
OBSERVATIONS:

From CRO:



1. Input voltage V_i =
2. Output voltage V_0 =
3. Voltage gain $A_V = V_0/V_i$ =
4. Phase shift θ =

From Frequency response:



1. Maximum gain A_{Vmax} =
2. Lower cutoff frequency(f1) at A_{Vmax}-3dB (decibel scale) value

   at $A_{Vmax}/\sqrt{2}$ (linear scale) =

3. Higher cutoff frequency(f2) at A_{Vmax}-3dB (decibel scale) value

   at $A_{Vmax}/\sqrt{2}$ (linear scale) =

CALCULATIONS:

Band width (BW) = f2 - f1

= Hz

RESULT: Cascode amplifier is design with the given specifications and from observed frequency response, gain and band width are calculated.

APPLICATION:

1. It is used in RF tunner.
2. Used in Amplitude Modulation.

VIVA QUACTIONS:

1. Why the case code amplifier provides a phase reversal?
2. In the dc equivalent circuit of an amplifier, how are capacitors treated?
3. What is the effect of bypass capacitor on frequency response?
4. Define lower and upper cutoff frequencies for an amplifier.
5. State the reason for fall in gain at low and high frequencies.
6. What is meant by unity gain frequency?
7. Define Bel and Decibel.
8. What do we represent gain in decibels?
9. Why do you plot the frequency response curve on a semi-log paper?
10. Explain the function of emitter bypass capacitor C_E?
11. What is the equation for voltage gain?
12. What is cut off frequency? What is lower 3dB and upper 3dB cut off frequency?
13. What are the applications of Case code amplifier?
14. What is active region?
15. What is Bandwidth of an amplifier?
16. What is the importance of gain bandwidth product?
17. Draw h parameter equivalent circuit of Case code amplifier.
18. What is the importance of coupling capacitors in Case code amplifier?
19. What is the importance of emitter by pass capacitor?
20. What type of feedback is used in case code amplifier?
21. What are the various types of biasing a Transistor?
22. What is Q point of operation of the transistor? What is the region of operation of the transistor when it is working as an amplifier?
23. Why frequency response of the amplifier is drawn on semi-log scale graph?
24. If Q point is not properly selected, then what will be the effect on the output waveform?
25. What are the typical values of the input impedance and output impendence of case code amplifier?
26. What is meant by unity gain frequency?
27. Define Bel and Decibel.
28. What do we represent gain in decibels?
29. Why do you plot the frequency response curve on a semi-log paper?
30. In the dc equivalent circuit of an amplifier, how are capacitors treated?

EXERCISE PROBLEMS:

1. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
2. Plot the frequency response of BC 107amplifier with C_2 = 5 µF with triangular i/p.
3. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
4. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K triangular i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with square i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
7. Plot the frequency response of amplifier with C_2 = 5 µF, triangular i/p.
8. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the amplitude response of BC107 amplifier with R_2 = 9.4 K triangular i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with square i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 µF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 µF with i/p.
13. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the amplitude response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 µF.
17. Plot the frequency response of amplifier with C_2 = 2 µF, i/p.
18. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the amplitude response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 µF with i/p.
23. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 µF.
27. Plot the frequency response of amplifier with C_2 = 5 µF, i/p.
28. Plot the amplitude response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. 30.Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 7.B

CASCODE AMPLIFIER (HARDWARE)

AIM: To design a Cascode amplifier with following specifications and to study the frequency response of amplifier, calculate voltage gain and bandwidth from the response.

DESIGN SPECIFICATIONS:

V_{CC} = 15 V, $I_{E1} = I_{E2}$ = 1 mA, A_{VT} = 100, f = 1 K Hz, R_C = 4.7 KΩ,

$\beta_1 = \beta_2 = 100$

CIRCUIT DIAGRAM:

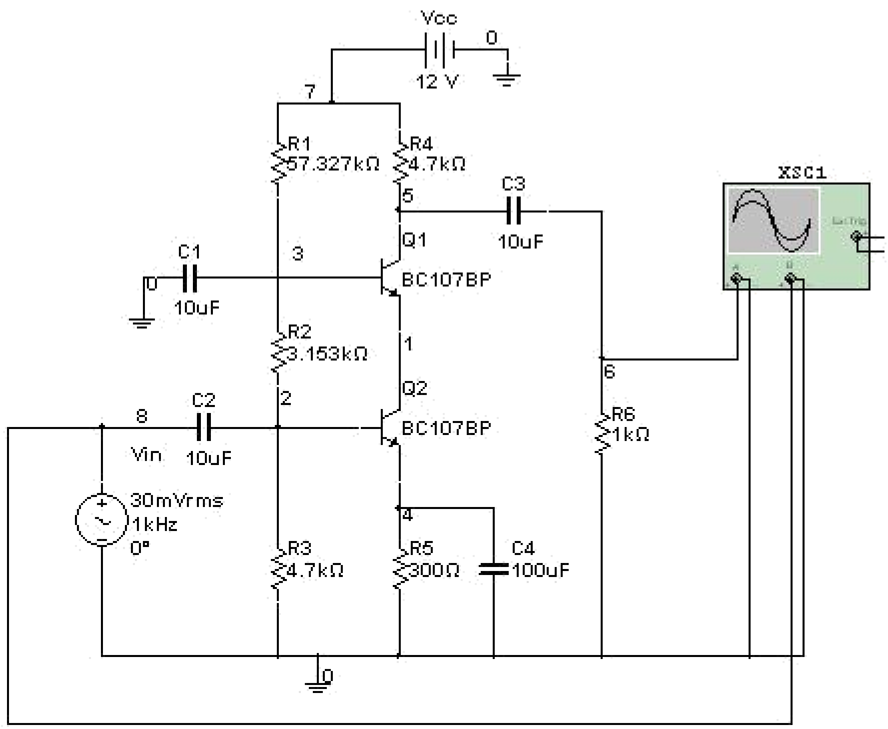


Fig: 7.b Cascode Amplifier circuit diagram

DESIGN PROCEDURE:

Calculation of R_E

Applying KVL to output loop

$V_{CC} = I_C R_C + V_{CE2} + V_{CE1} + I_E R_E$

$V_{CE1} = V_{CE2} \leq V_{CC}/3 = 15/3 = 5$ V

$I_C = I_{E1} = 1$ mA

$R_E =$ Ω

Calculation of R_1 and R_2

$\beta_1 = \beta_2 = 100$

$$I_C = \frac{}{I_B}$$

$$I \quad \frac{I_C \, 10^3}{100} \quad B$$

$I_B =$ ________________ µA

$$I_3 \quad \frac{V_{B1}}{R_3} =$$

$V_{B1} = V_{BE2} + V_{E1}$

$= 0.7 + I_E R_E$

$V_{B1} =$ ___________ V

$I_3 =$ ___________ mA

$I_2 = I_{B1} + I_3$

$I_2 =$ __________ mA

$$I_2 = \frac{V_{B2} - V_{B1}}{R_2} =$$

Where $V_{B2} = V_{BE2} + V_{E1}$

$V_{B2} =$ ____________V

$R_2 =$ ____________ Ω

$I_1 = I_{B2} + I_2$

$I_1 =$ ____________ A

$$R_1 = \frac{V_{CC} - V_{B2}}{I_1}$$

$R_1 =$____________ Ω

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the function generator with sine wave of 50mVp-p as input at the input of terminals of the circuit.
5. Connect the Cathode Ray Oscilloscope (CRO) to the out put terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. From the CRO note the following values
    1. Input voltage V_i =
    2. Output voltage V_0 =
    3. Voltage gain $A_V = V_0/V_i$ =
    4. Phase shift θ =
8. To study the frequency response click the AC analysis, so that a screen displays the following options

1. Start frequency
2. Stop frequency
3. Vertical scale

9. Assign the proper values for start frequency, stop frequency and vertical scale according to the circuit requirements and observe the frequency response.
10. From the frequency response calculate the
    maximum gain A_{Vmax} =

    lower cutoff frequency (f1) at A_{Vmax}-3dB (decibel scale) value

    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

    Higher cutoff frequency (f2) at A_{Vmax}-3dB (decibel scale) value

    at $A_{Vmax}/\sqrt{2}$ (linear scale) =

RESULT: Cascode amplifier is design with the given specifications and from observed frequency response, gain and band width are calculated.

EXPT NO: 8.A

WEIN BRIDGE OSCILLATOR (SOFTWARE)

AIM: To study the frequency response of Oscillator, calculate voltage gain and bandwidth from the response.

SOFTWARE USED:

Multisim V 13.0

CIRCUIT DIAGRAM:

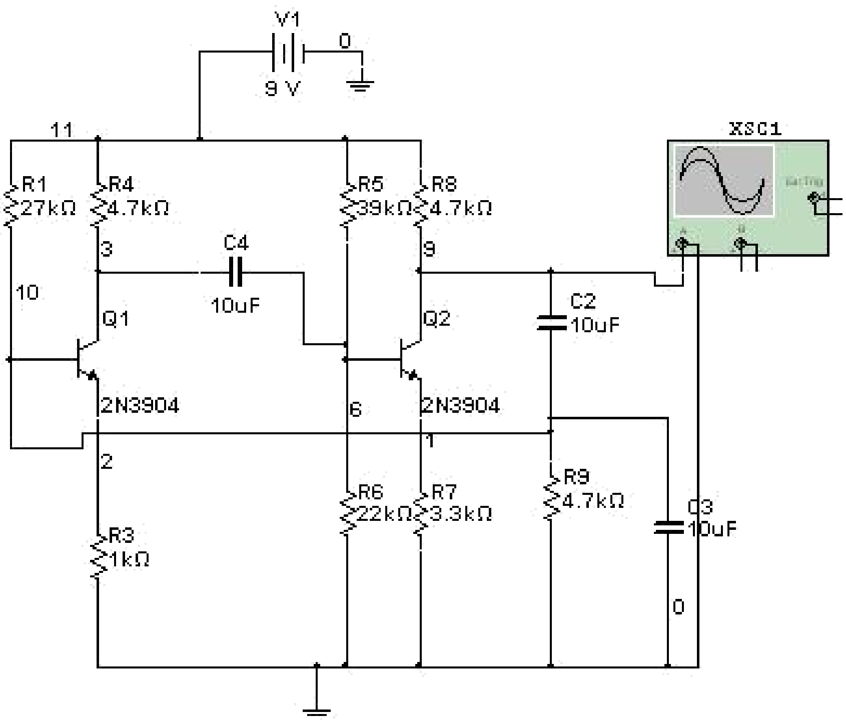
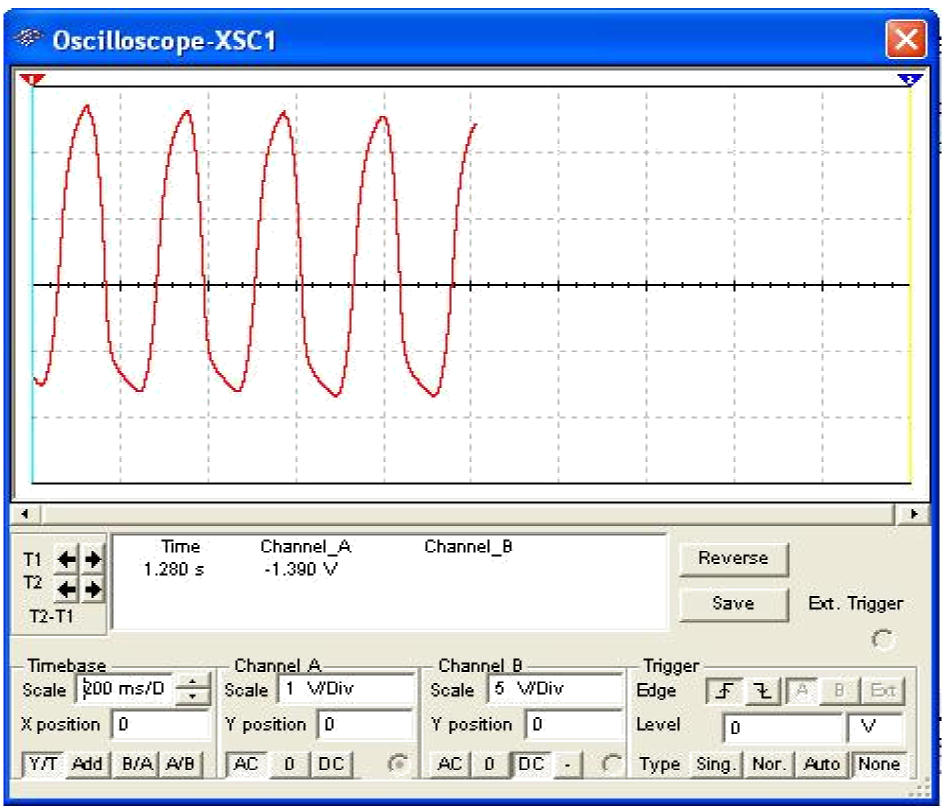


Fig: 8.a Wien bridge oscillator circuit diagram

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the Cathode Ray Oscilloscope (CRO) to the out put terminals of the circuit.
5. Go to simulation button click it for simulation process.
6. From the CRO note the following values
    1. Amplitude of the output wave form
    2. Time period of the signal

OBSERVATIONS:



From CRO:

1. Amplitude of the output wave form
2. Time period of the signal

CALCULATIONS:

Theoretically:

Where R =

C =

$$f \quad \frac{1}{2x\ xRxC} =$$

RESULT:

1. For C = 0.0022 F & R=10K
   Theoretical frequency=
   Practical frequency=
2. For C = 0.0033 F & R=10K
   Theoretical frequency=
   Practical frequency=
3. For C = 0.01 F & R=10K
   Theoretical frequency=
   Practical frequency=

APPLICATIONS:

It is used to measure the audio frequency.
Wien bridge oscillator designs the long range of frequencies It produces sine wave

EXERCISE PROBLEMS:

1. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
2. Plot the Amplitude response of 2N2222 Oscillator C2 = 5 μF with i/p.
3. Plot the Amplitude response of BC107 Oscillator with R_1 = 4.1 K.
4. Plot the Amplitude response of BC 547 Oscillator with R_2 = 9.4 K i/p.
5. Plot the Amplitude response of BC 548 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the Amplitude response of BC 557 Oscillator with C_1 = 5 μF.
7. Plot the Amplitude response of BC 547 Oscillator with C_2 = 5 μF, i/p.
8. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
9. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
10. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 10 μF.
12. Plot the Amplitude response of CL100 Oscillator with C_2 = 2 μF with i/p.
13. Plot the Amplitude response of CL 100 Oscillator with R_1 = 2.1 K.
14. Plot the Amplitude response of CK 100 Oscillator with R_2 = 5.4 K i/p.
15. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 2 μF.
17. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 2 μF, i/p.
18. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 2.1 K.
19. Plot the Amplitude response of SL100 Oscillator with R_2 = 2.4 K i/p.
20. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
22. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 5 μF with i/p.
23. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
24. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
25. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
27. Plot the Amplitude response of 2N3904 Oscillator C2 = 5 μF, i/p.
28. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
29. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
30. Plot the Amplitude response of 2N3904 Oscillator of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 8.B

WEIN BRIDGE OSCILLATOR (HARDWARE)

AIM: To study the frequency response of Oscillator, calculate voltage gain and bandwidth from the response.

COMPONENTS AND EQUIPMENTS REQUIRED:

S.No	Device	Range/ Rating	Qty
1	a) DC supply voltage b) Capacitor c) Resistor d) NPN Transistor	12V 10 F 10K ,4.7K ,27K 22K ,3.3K ,39K 1K , 2N3904	1 2 3 3 1 2
2	CRO	(0-20) MHz	1
3.	BNC Connector		1
3	Connecting wires	5A	6

CIRCUIT DIAGRAM:

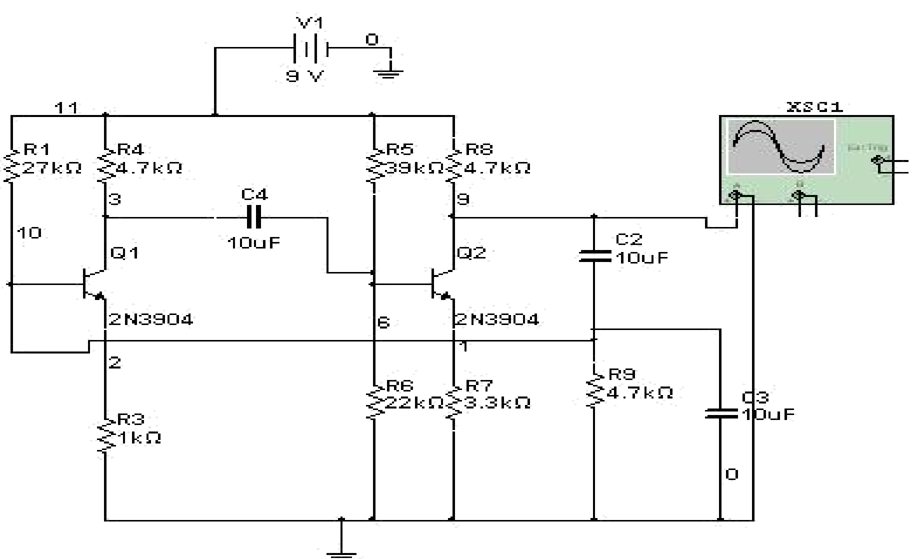


Fig: 8.b Wien bridge oscillator circuit diagram

PROCEDURE:

1. Connect the circuit as shown in figure.
2. Connect the 0.0022 F capacitors in the circuit and observe the waveform.
3. Time period of the waveform is to be noted and frequency should be calculated by the formula f = 1/T.
4. Now fix the capacitance to 0.033 F and 0.01 F and calculate the frequency and tabulate as shown.
5. Find theoretical frequency from the formula f = 1/2 RC 6 and compare theoretical and practical frequencies.

OBSERVATIONS:

From CRO:

1. Amplitude of the output wave form
2. Time period of the signal

CALCULATIONS:

Theoretically:

Where R =

C =

$$f \quad \frac{1}{2x \;\; xRxC} =$$

RESULT: -

1. For C = 0.0022 F & R=10K
   Theoretical frequency=
   Practical frequency=
2. For C = 0.0033 F & R=10K
   Theoretical frequency=
   Practical frequency=
3. For C = 0.01 F & R=10K

Theoretical frequency=
Practical frequency=

VIVA QUESTIONS:

1. Mention two essential conditions for a circuit to maintain oscillations?
2. What is the major disadvantage of a Twin-T oscillator?
3. Differentiate oscillator from amplifier?
4. State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity?
5. Why an LC tank circuit does not produce sustained oscillations. How can this can be overcome
6. Draw the electrical equivalent circuit of crystal. and mention its series and parallel resonance frequency?
7. What are the advantages and disadvantages of RC phase shift oscillators?
8. What is the necessary condition for a Wien bridge oscillator circuit to have sustained oscillations?
9. Define piezoelectric effect?
10. What is the principle behind operation of a crystal oscillator?
11. Draw an oscillator circuit with feedback network given below.
12. What are the advantages and disadvantages of wein bridge oscillators?
13. A weinbridge oscillator is used for operations at 9 KHz. If the value of resistance R is 100KΩ, what is the value of C required?
14. A weinbridge oscillator is used for operations at 10 KHz. If the value of resistance R is 100KΩ, what is the value of C required?
15. A tuned collector oscillator in a radio receiver has a fixed inductance of 60μH and has to be tunable over the frequency band of 400 KHz to 1200KHz. Find the range of variable capacitor to be used.
16. Draw the feedback circuit of a colpitts oscillator. Obtain the value of the equivalent series capacitance required if it uses a L of 100mH and is to oscillate at 40KHz.
17. What is the major disadvantage of a Twin-T oscillator?
18. Differentiate oscillator from amplifier.

19. State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity?

20. Why an LC tank circuit does not produce sustained oscillations. How can this can be overcome?

21. Draw the electrical equivalent circuit of crystal. and mention its series and parallel resonance frequency.

22. In a Hartley oscillator if L_1=0.2mH,L_2=0.3mH and C=0.003µF. calculate the frequency of its oscillations.

23. In an RC phase shift oscillator, if its frequency of oscillation is 955Hz and $R_1=R_2=R_3$=680KΩ.Find the value of capacitors.

24. In an RC phase shift oscillator, if $R_1=R_2=R_3$=200KΩ and $C_1=C_2=C_3$=100pF. Find the frequency of the oscillator.

25. A crystal has the following parameters L=0.5H, C=0.05pF and mounting capacitance is 2pF. Calculate its series and parallel resonating frequencies.

26. Calculate the frequency of oscillation for the clap oscillator with C_1=0.1µF, C_2=1µF, C_1=100pF and L=470µH.

27. What is the principle behind operation of a crystal oscillator?

28. Draw an oscillator circuit with feedback network given below.

29. What are the advantages and disadvantages of wein bridge oscillators?

30. A weinbridge oscillator is used for operations at 9KHz. If the value of resistance R is 100KΩ, what is the value of C required?

EXPT NO: 9.A

RC PHASE SHIFT OSCILLATOR (Software)

PRELAB:

1. Study the different types of oscillator and their conditions.
2. Identify all the formulae you will need in this Lab.

OBJECTIVE:

1. To simulate RC phase shift oscillator in Multisim and study the transient response.
2. To determine the phase shift of RC network in the circuit.

SOFTWARE TOOL:

Multisim v 13.0

APPARATUS:

1. Regulated power supply	-	1 No.
2. Function generator	-	1 No.
3. CRO	-	1 No.
4. Transistor (BC 107 or 2N2222)	-	2 No.
5. Resistors (47 KΩ, 2.2 KΩ, 1k)	-	1 No. each
6. Resistor (10 KΩ)	-	3 Nos.
7. Capacitors (10 µF, 100 µF)	-	1No. each
(1nf,or 10nf)	-	3 No.

CIRCUITDIAGRAM:

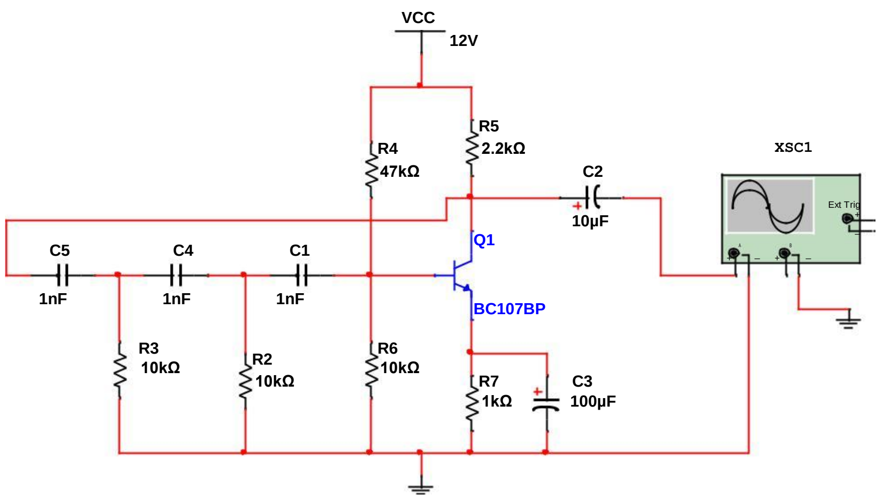


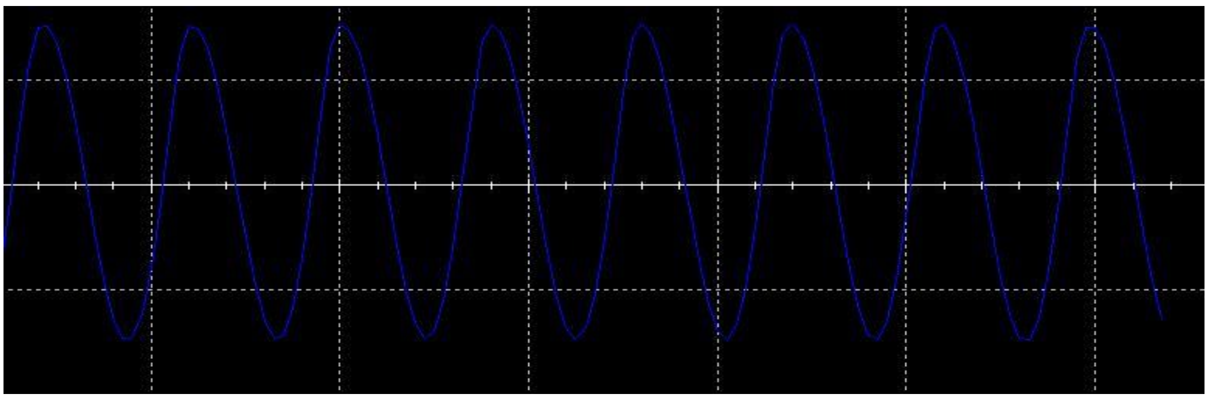
Fig: 9.a RC Phase Shift oscillator

PROCEDURE:

1. Open Multisim Software to design RC Phase shift oscillator
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and check the connections and oscillator.
4. Go for simulation and using Run Key observe the output waveforms on CRO
5. Observe the Transient Response and Calculate the Frequency of the oscillator

OBSERVATIONS/GRAPHS:

TRANSIENT RESPONSE:



RESULT:

1. For C = 0.0022 F & R=10K
    i. Theoretical frequency=
    ii. Practical frequency=
2. For C = 0.0033 F & R=10K
    i. Theoretical frequency=
    ii. Practical frequency=
3. For C = 0.01 F & R=10K
    i. Theoretical frequency=
    ii. Practical frequency=

APPLICATIONS:

FET phase-shift oscillator is used for generating signals over a wide frequency range. The frequency may be varied from a few Hz to 200 Hz by employing one set of resistor with three capacitors ganged together to vary over a capacitance range in the 1 : 10 ratio.

VIVA QUESTIONS:

1. What are the conditions of oscillations?
2. Give the formula for frequency of oscillations?
3. What is the total phase shift produced by RC ladder network?
4. What are the types of oscillators?
5. What is the gain of RC phase shift oscillator?
6. What is the frequency of RC phase shift oscillator?
7. What is a phase shift oscillator?
8. Why RC oscillators cannot generate high frequency oscillations?
9. What are the applications of RC phase shift oscillators?
10. What phase shift does RC phase shift oscillator produce?
11. Why we need a phase shift between input and output signal?
12. How is phase angle determined in RC phase shift oscillator?
13. How can we get a maximum phase angle of 90 degrees in RC phase shift oscillator?
14. What is an Oscillator?.
15. Which feedback used in oscillators?
16. What is the output of an oscillator if transistor is ideal?
17. What are LC oscillators?
18. Why can't we use LC oscillator for low frequency oscillations?
19. How an oscillator generates oscillations without any input?
20. Classify oscillators?
21. Why RC oscillators cannot generate high frequency oscillations?
22. What are the applications of RC phase shift oscillators?
23. What phase shift does RC phase shift oscillator produce?
24. Why we need a phase shift between input and output signal?
25. What are the conditions of oscillations?
26. Give the formula for frequency of oscillations
27. Why RC oscillators cannot generate high frequency oscillations?
28. What are the applications of RC phase shift oscillators?
29. What is an Oscillator?.
30. Which feedback used in oscillators?

EXERCISE PROBLEMS:

1. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
2. Plot the Amplitude response of 2N2222 Oscillator C2 = 5 μF with i/p.
3. Plot the Amplitude response of BC107 Oscillator with R_1 = 4.1 K.
4. Plot the Amplitude response of BC 547 Oscillator with R_2 = 9.4 K i/p.
5. Plot the Amplitude response of BC 548 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the Amplitude response of BC 557 Oscillator with C_1 = 5 μF.
7. Plot the Amplitude response of BC 547 Oscillator with C_2 = 5 μF, i/p.
8. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
9. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
10. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 10 μF.
12. Plot the Amplitude response of CL100 Oscillator with C_2 = 2 μF with i/p.
13. Plot the Amplitude response of CL 100 Oscillator with R_1 = 2.1 K.
14. Plot the Amplitude response of CK 100 Oscillator with R_2 = 5.4 K i/p.
15. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 2 μF.
17. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 2 μF, i/p.
18. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 2.1 K.
19. Plot the Amplitude response of SL100 Oscillator with R_2 = 2.4 K i/p.
20. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
22. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 5 μF with i/p.
23. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
24. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
25. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
27. Plot the Amplitude response of 2N3904 Oscillator C2 = 5 μF, i/p.
28. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
29. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
30. Plot the Amplitude response of 2N3904 Oscillator of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 9.B

RC PHASE SHIFT OSCILLATOR (Hardware)

AIM:

Find practical frequency of RC phase shift oscillator and to compare it with theoretical frequency for R=10K and C = 0.01 F, 0.0022 F & 0.0033 F respectively

COMPONENTS AND EQUIPMENTS REQUIRED:

S.No	Device	Range/ Rating	Qty
1	a) DC supply voltage b) Capacitor c) Resistor d) NPN Transistor	12V 100 F 10 F 10K ,5.6K 22K ,100K 1K , BC 107	1 1 2 2 3 3 1
2	CRO	(0-20) MHz	1
3.	BNC Connector		1
3	Connecting wires	5A	6

CIRCUIT DIAGRAM:

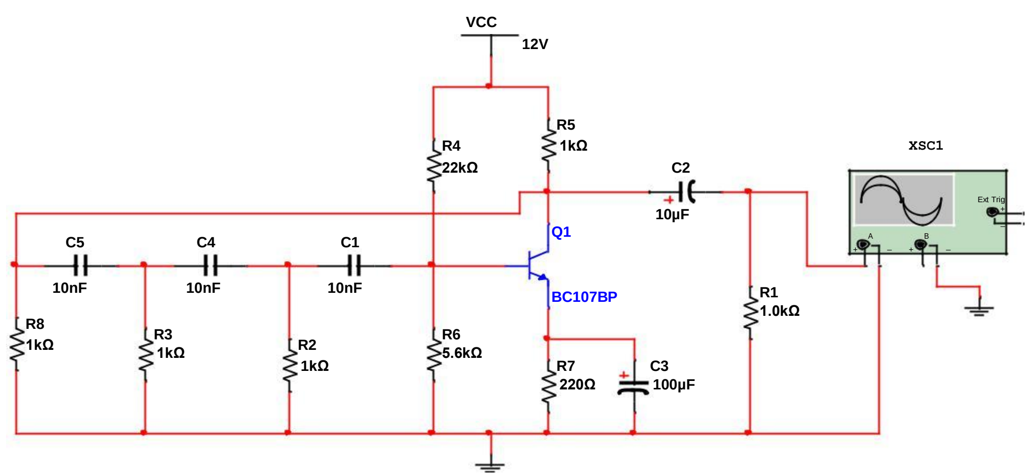


Fig: 9.b RC Phase shift oscillator

PROCEDURE:

Connect the circuit as shown in figure.

Connect the 0.0022   F capacitors in the circuit and observe the waveform.

Time period of the waveform is to be noted and frequency should be calculated by the formula f = 1/T.

Now fix the capacitance to 0.033 F and 0.01 F and calculate the frequency and tabulate as shown.

Find theoretical frequency from the formula f = 1/2 RC 6 and compare theoretical and practical frequencies.

PRECAUTIONS: -

No loose contacts at the junctions.

TABULAR COLUMN:

S.No	C (F)	R ( )	Theoretical Frequency (KHz)	Practical Frequency (KHz)	V_o (p-p) (Volts)
1	10nf	1k			
2	1nf	1K			
3	10n	10K			

RESULT: -

1. For C = 0.0022 F & R=10K
   i. Theoretical frequency=
   ii. Practical frequency=
2. For C = 0.0033 F & R=10K
   i. Theoretical frequency=
   ii. Practical frequency=
3. For C = 0.01 F & R=10K
   i. Theoretical frequency=
   ii. Practical frequency=

EXPT NO: 10.A

CLASS A POWER AMPLIFIER (Transformer less)(software)

AIM: To calculate the efficiency of Class A power amplifier.

SOFTWARE TOOL:

Multisim V 13.0

APPARATUS REQUIRED:

1. Function generator
2. Regulated power supply (0 - 30V)
3. CRO (0-20MHz) - 1No
4. Transistor (SL - 100) - 1No.
5. Resistors (20 KΩ, 100 Ω) - 1No.
6. Capacitor (10 μF) - 1No.

CIRCUIT DIAGRAM:

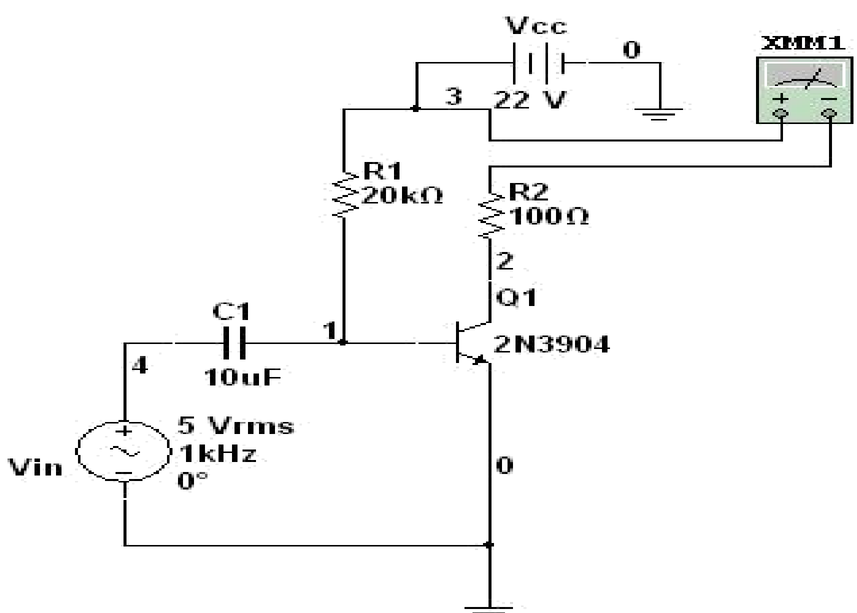
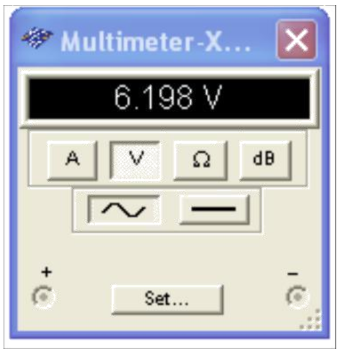


Fig: ClassA power amplifier circuit diagram

PROCEDURE:

1. Connect the circuit as per the diagram.
2. Connect the function generator with sine wave of 0.3 V p-p as input at the input terminals of the circuit.
3. Note down the multi meter readings across the RL resistor. (V_{ac} and I_{dc})
4. Calculate the efficiency.

OBSERVATIONS:



From Multimeter

V_{ac} = ______ V

I_{dc} = ______ mA

Calculations:

$P_{dc} = V_{CC} \times I_{dc} =$

$P_{ac} = V_{ac}^2/R_L =$

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

RESULT: The efficiency of Class A power amplifier is calculated

APPLICATIONS:

1. The Class A Amplifier more suitable for outdoor musical systems, since the transistor reproduces the entire audio waveform without ever cutting off. As a result, the sound is very clear and more linear, that is, it contains much lower levels of distortion.
2. They are usually very large, heavy and they produce nearly 4-5 watts of heat energy per a watt of output. Therefore, they run very hot and need lots of ventilation. So they are not at all ideal for a car and rarely acceptable in a home.

VIVA QUESTIONS:

1. Differentiate between voltage amplifier and power amplifier?

2. Why power amplifiers are considered as large signal amplifier?

3. When does maximum power dissipation happen in this circuit?

4. What is the maximum theoretical efficiency?

5. Sketch wave form of output current with respective input signal.

6. What are the different types of class-A power amplifiers available?

7. What is the theoretical efficiency of the transformer coupled class-A power amplifier?

8. What is difference in AC, DC load line?

9. How do you locate the Q-point?

10. What are the applications of class-A power amplifier?

11. Define class A power amplifier?

12. Give the reason why class A power amplifier is called as directly coupled power amplifier?

13. What is the efficiency of class A power amplifier?

14. In class-A power amplifier, when the maximum power dissipation takes place in the transistor?

15.List out the different types of distortions?6.Define Harmonic distortion?

16. What are Class B, Class C and Class AB amplifiers and which type is used for what application?
17. Differentiate between voltage amplifier and power amplifier
18. Why power amplifiers are considered as large signal amplifier?
19. What is the theoretical efficiency of the transformer coupled class-A power amplifier?
20. Sketch wave form of output current with respective input signal.
21. How do you locate the Q-point?
22. When does maximum power dissipation happen in this circuit?
23. What are the different types of class-A power amplifiers available?
24. When does maximum power dissipation happen in this circuit?
25. What is the maximum theoretical efficiency?
26. Sketch wave form of output current with respective input signal.
27. What are the applications of class-A power amplifier?
28. Give the reason why class A power amplifier is called as directly coupled power amplifier?
29. How do you locate the Q-point?
30. When does maximum power dissipation happen in this circuit?

EXERCISE PROBLEMS:

1. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
2. Plot the frequency response of BC 107amplifier with C_2 = 5 μF with triangular i/p.
3. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
4. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K triangular i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with square i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
7. Plot the frequency response of amplifier with C_2 = 5 μF, triangular i/p.
8. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the amplitude response of BC107 amplifier with R_2 = 9.4 K triangular i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with square i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 μF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 μF with i/p.
13. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the amplitude response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 μF.
17. Plot the frequency response of amplifier with C_2 = 2 μF, i/p.
18. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the amplitude response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 μF with i/p.
23. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
27. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
28. Plot the amplitude response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. .Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 10.B

CLASS A POWER AMPLIFIER (Transformer less)(Hardware)

AIM: To calculate the efficiency of Class A power amplifier.

APPARATUS REQUIRED:

1. Function generator
2. Regulated power supply (0 - 30V)
3. Bread board
4. Transistor (SL - 100) - 1No.
5. Resistors (20 KΩ, 100 Ω) - 1No.
6. Capacitor (10 μF) - 1No.
7. Digital multi meter - 1No.
8. Connecting wires

CIRCUIT DIAGRAM:

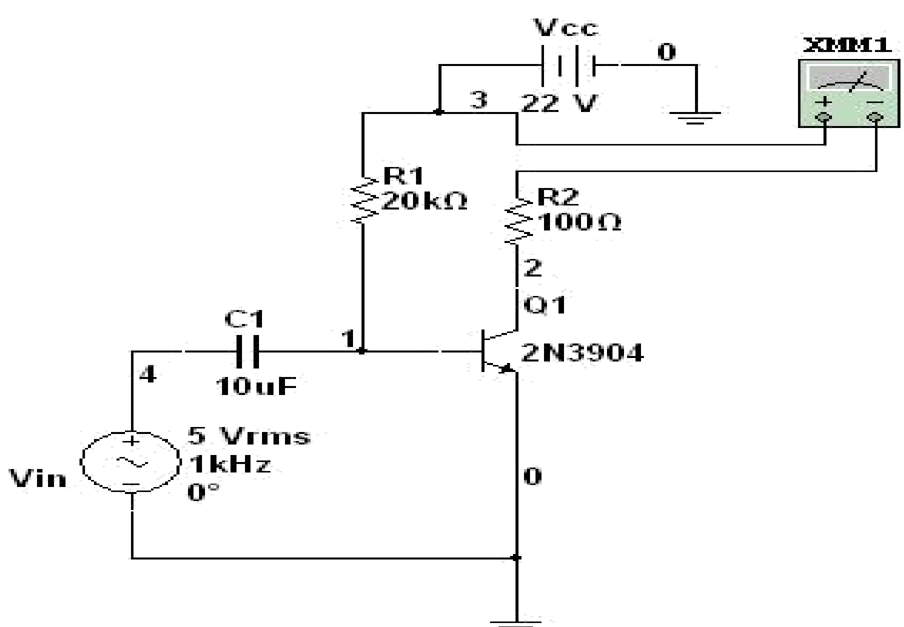


Fig: 10.b ClassA power amplifier circuit diagram

PROCEDURE:

1. Connect the circuit as per the diagram.
2. Connect the function generator with sine wave of 0.3 V p-p as input at the input terminals of the circuit.
3. Note down the multi meter readings across the RL resistor. (V_{ac} and I_{dc})
4. Calculate the efficiency.

OBSERVATIONS:

From Multimeter

V_{ac} = ________ V

I_{dc} = _________ mA

Calculations:

$P_{dc} = V_{CC} \times I_{dc} =$

$P_{ac} = V_{ac}^2/R_L =$

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

RESULT: The efficiency of Class A power amplifier is calculated.

EXPT NO: 11.A

CLASS B COMPLEMENTARY SYMMETRY AMPLIFIER (SOFTWARE)

AIM: To observe the Cross over distortion of Class B complementary symmetry power amplifier.

SOFTWARE USED:

Multisim V13.0

APPARATUS REQUIRED:

1. Function generator - 1No.
2. Cathode Ray oscilloscope (CRO) - 1No.
3. Regulated power supply (0-30V) - 1No.
4. Transistor (2N3905, 2N3904) - 1No.
5. Resistor (1KΩ) - 1No.

CIRCUIT DIAGRAM:

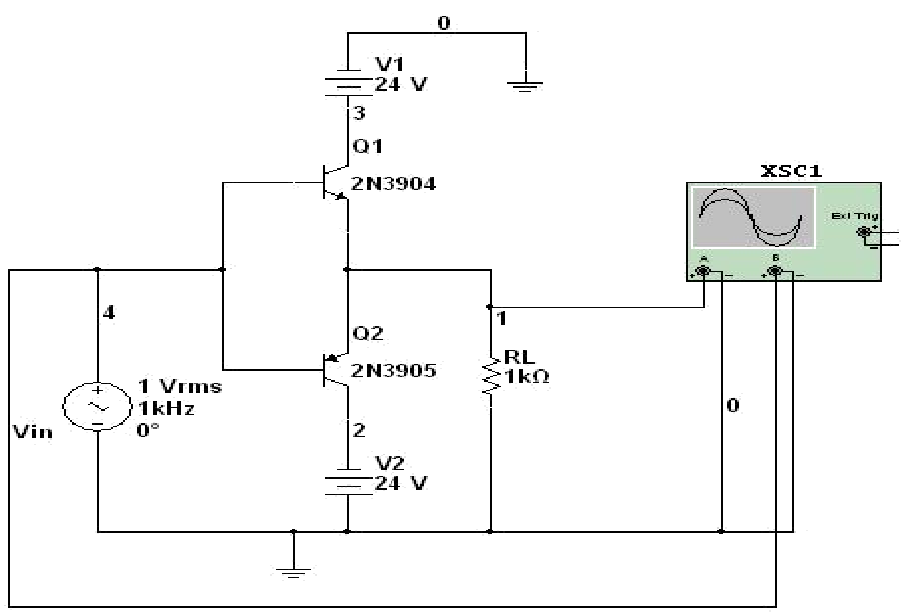
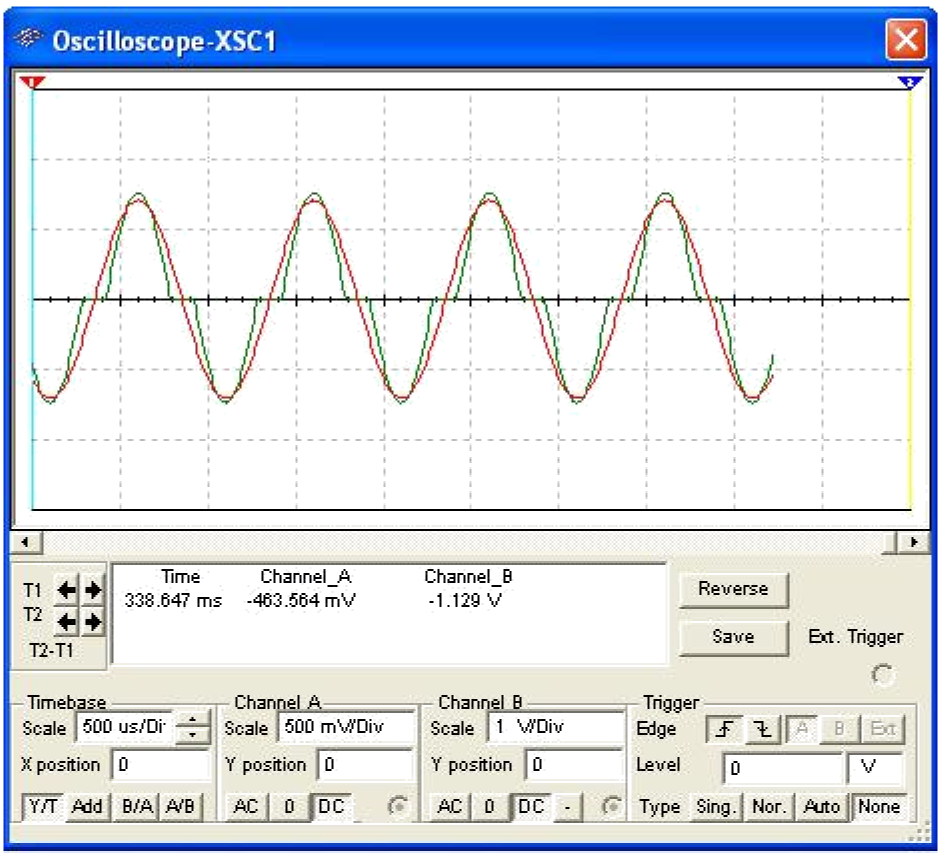


Fig: Class B complementary symmetry power amplifier. Circuit diagram

PROCEDURE:

1. Switch ON the computer and open the multisim software.
2. Check whether the icons of the instruments are activated and enable.
3. Now connect the circuit using the designed values of each and every component.
4. Connect the function generator with sine wave of 30mV p-p as input at the input of terminals of the circuit.
5. Connect the Cathode Ray Oscilloscope (CRO) to the output terminals of the circuit.
6. Go to simulation button click it for simulation process.
7. Observe the cross over distortion in the CRO.

OBSERVATION:



RESULT: -

1. Frequency response of Current shunt amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.

VIVA QUESTIONS:

1. Differentiate between voltage amplifier and power amplifier
2. Why power amplifiers are considered as large signal amplifier?
3. When does maximum power dissipation happen in this circuit?
4. What is the maximum theoretical efficiency?
5. Sketch wave form of output current with respective input signal.
6. What are the different types of class-Bpower amplifiers available?
7. What is the theoretical efficiency of the transformer coupled class-A power amplifier?
8. What is difference in AC, DC load line?
9. How do you locate the Q-point?
10. What are the applications of class-Bpower amplifier?
11. Define class –B power amplifier?
12. Give the reason why class -B power amplifier is called as directly coupled power amplifier?
13. What is the efficiency of class –B power amplifier?
14. In class-B power amplifier, when the maximum power dissipation takes place in the transistor?
15. List out the different types of distortions?
16. What are Class B, Class C and Class AB amplifiers and whichtype is used for what application?
17. Differentiate between voltage amplifier and power amplifier
18. Why power amplifiers are considered as large signal amplifier?
19. What is the theoretical efficiency of the transformer coupled class-B power amplifier?
20. Sketch wave form of output current with respective input signal.
21. How do you locate the Q-point?
22. When does maximum power dissipation happen in this circuit?
23. What are the different types of class-B power amplifiers available?
24. When does maximum power dissipation happen in this circuit?
25. What is the maximum theoretical efficiency?
26. Sketch wave form of output current with respective input signal.
27. What are the applications of class-B power amplifier?
28. Give the reason why class –B power amplifier is called as directly coupled power amplifier?
29. How do you locate the Q-point?
30. When does maximum power dissipation happen in this circuit?

EXERCISE PROBLEMS:

1. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
2. Plot the frequency response of BC547 amplifier with C_2 = 5 μF with triangular i/p.
3. Plot the amplitude response of BC 557 amplifier with R_1 = 4.1 K.
4. Plot the amplitude response of BC 548 amplifier with R_2 = 9.4 K triangular i/p.
5. Plot frequency response of SL 100 amplifier R_1 = 4.1 K, R_2 = 9.4 K with square i/p.
6. Plot the frequency and amplitude response of CL 100 amplifier with C_1 = 5 μF.
7. Plot the frequency response of amplifier with C_2 = 5 μF, triangular i/p.
8. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the amplitude response of BC107 amplifier with R_2 = 9.4 K triangular i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with square i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 μF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 μF with i/p.
13. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the amplitude response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 μF.
17. Plot the frequency response of amplifier with C_2 = 2 μF, i/p.
18. Plot the amplitude response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the amplitude response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 μF with i/p.
23. Plot the amplitude response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
27. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
28. Plot the amplitude response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the amplitude response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. .Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 12.A

HARTLEY OSCILLATOR (software)

PRELAB:
Study the operation and working principle Hartley oscillator.
OBJECTIVE:
To design Hartley oscillator using Multisim software and calculate the frequency

APPARATUS:

1. Transistor – BC 107
2. Resistors – 1K, 5K,10K,100K,
3. Capacitors – 100nF(3),10nf
4. Inductor-10mH or 1mH.
5. RPS
6. CRO
7. Breadboard
8. Connecting wires and probes

SOFTWARE TOOL: Multisim V 13.0

CIRCUIT DIAGRAM:

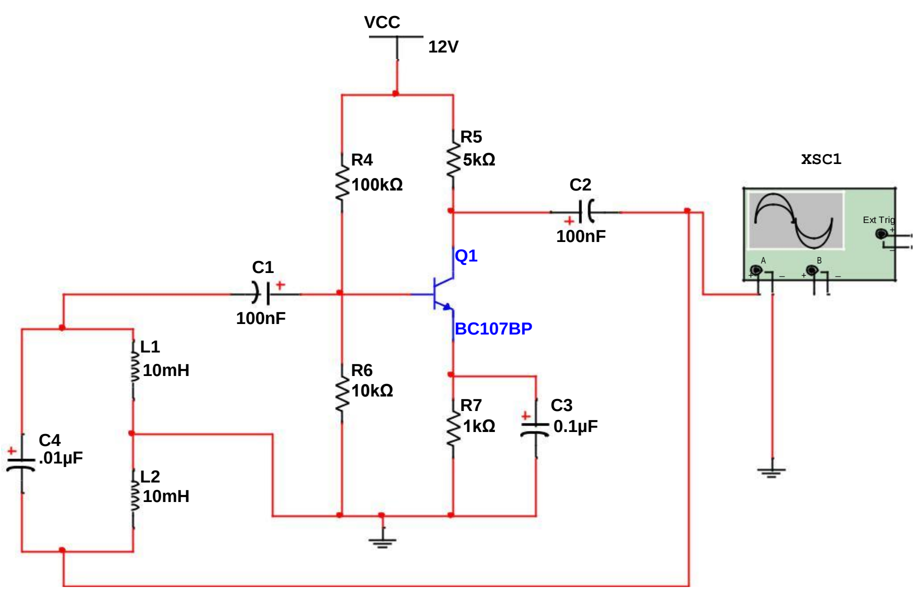
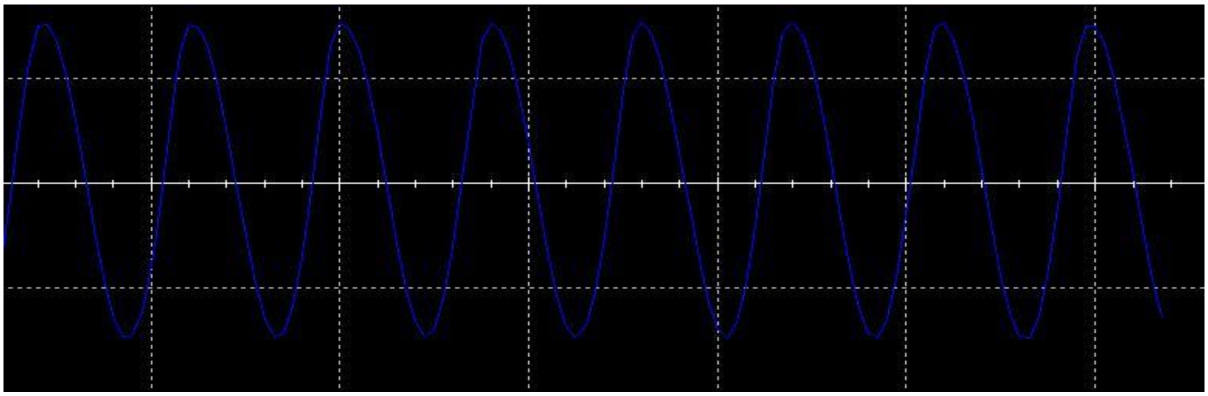


Fig: 12.a Hartley oscillator circuit diagram

PROCEDURE:

1. Open Multisim Software to design Hartley oscillator circuit
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and check the connections and oscillator.
4. Go for simulation and using Run Key observe the output waveforms on CRO
5. Calculate the frequency theoretically and practically

OBSERVATIONS/GRAPHS:



RESULT: -

1. Out frequency for L1=L2=10mH, C=10nf is_________
2. Out frequency for L1=L2=10mH, C=100nf is_________
3. Out frequency for L1=L2=20mH, C=10nf is_________
1. Out frequency for L1=5, L2=10mH, C=10nf is_________

APPLICATIONS:

The Hartley oscillator is to produce a sine wave with the desired frequency

Hartley oscillators are mainly used as radio receivers. Also note that due to its wide range of frequencies, it is the most popular oscillator

The Hartley oscillator is Suitable for oscillations in RF (Radio-Frequency) range, up to 30MHZ

VIVA QUESTIONS:

1. Define an oscillator?
2. Define barkhausen criteria
3. Which type of feedback is employed in oscillators
4. Give applications for oscillators
5. What is the condition for sustained oscillations
6. Draw an oscillator circuit with feedback network given below.
7. What is the principle behind operation of a *HARTLEY* oscillator?
8. What are the advantages and disadvantages of *HARTLEY* oscillators?
9. Mention two essential conditions for a circuit to maintain oscillations[
10. Define an oscillator?
11. Define barkhausen criteria
12. Which type of feedback is employed in oscillators
13. Give applications for oscillators
14. What is an Oscillator?
15. Which feedback used in oscillators?
16. Classify oscillators?
17. which oscillators are AF oscillators?
18. Draw an oscillator circuit with feedback network given below.
19. What is the principle behind operation of a *HARTLEY* oscillator?
20. What are the advantages and disadvantages of *HARTLEY* oscillators?
21. Mention two essential conditions for a circuit to maintain oscillations[
22. Define an oscillator?
23. Define barkhausen criteria
24. What are RC oscillators?
25. Mention two essential conditions for a circuit to maintain oscillations[
26. Define an oscillator?
27. Define barkhausen criteria
28. Which type of feedback is employed in oscillators
29. Give applications for oscillators
30. Which oscillators are AF oscillators?

EXERCISE PROBLEMS:

1. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 µF.
2. Plot the Amplitude response of 2N2222 Oscillator C2 = 5 µF with i/p.
3. Plot the Amplitude response of BC107 Oscillator with R_1 = 4.1 K.
4. Plot the Amplitude response of BC 547 Oscillator with R_2 = 9.4 K i/p.
5. Plot the Amplitude response of BC 548 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the Amplitude response of BC 557 Oscillator with C_1 = 5 µF.
7. Plot the Amplitude response of BC 547 Oscillator with C_2 = 5 µF, i/p.
8. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
9. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
10. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 10 µF.
12. Plot the Amplitude response of CL100 Oscillator with C_2 = 2 µF with i/p.
13. Plot the Amplitude response of CL 100 Oscillator with R_1 = 2.1 K.
14. Plot the Amplitude response of CK 100 Oscillator with R_2 = 5.4 K i/p.
15. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 2 µF.
17. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 2 µF, i/p.
18. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 2.1 K.
19. Plot the Amplitude response of SL100 Oscillator with R_2 = 2.4 K i/p.
20. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 µF.
22. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 5 µF with i/p.
23. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
24. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
25. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 µF.
27. Plot the Amplitude response of 2N3904 Oscillator C2 = 5 µF, i/p.
28. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
29. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
30. Plot the Amplitude response of 2N3904 Oscillator of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 12.B

HARTLEY OSCILLATOR (Hardware)

AIM:

Find practical frequency of a Hartley oscillator and to compare it with theoretical frequency for L = 10mH and C = 0.01 F, 0.033 F and 0.047 F.

COMPONENTS AND EQUIPMENTS REQUIRED:

S.No	Device	Range/Rating	Quantity
1	a) DC supply voltage b) Inductors c) Capacitor d) Resistor e) NPN Transistor	12V 5mH 0.01 F,0.022 F;0.033 F 0.047 F 1K ,10K ,47K BC 107	1 2 1 1 1 1
2	Cathode Ray Oscilloscope	(0-20) MHz	1
3.	BNC Connector		1
4	Connecting wires	5A	4

CIRCUIT DIAGRAM:

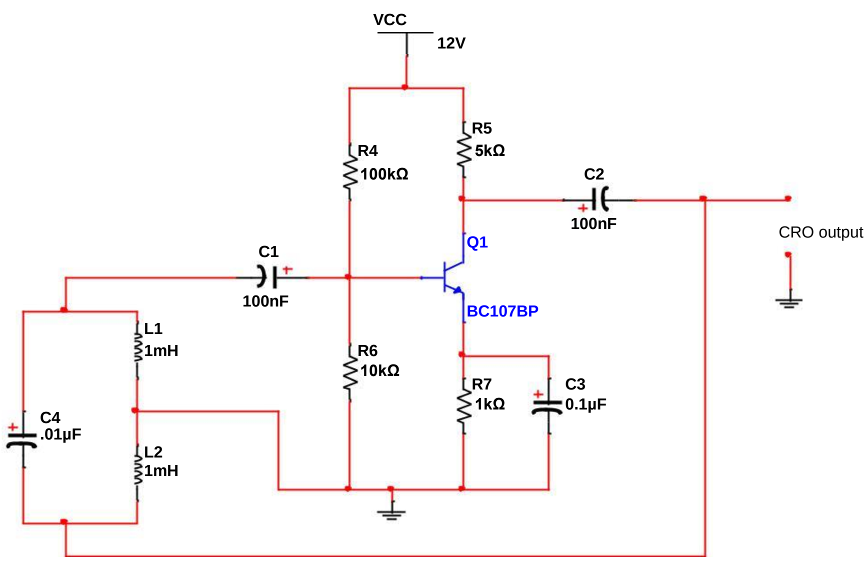


Fig: 12.bHartley oscillator circuit diagram

PROCEDURE:

1. Connect the circuit as shown in figure.
2. With 0.1 F capacitor and 20mH in the circuit and observe the waveform.
3. Time period of the waveform is to be noted and frequency is to be calculated by the formula f = 1/T .
4. Now fix the capacitance to 0.033 F and 0.047 F and calculate the frequency and tabulate the readings as shown.
5. Find the theoretical frequency from the formula $f = \dfrac{1}{2\sqrt{L_T C}}$ Where $L_T = L_1 + L_2$ = 5mH + 5mH = 10mH and compare theoretical and practical values.

PRECAUTIONS: No loose contacts at the junctions.

TABULATIONS:

S.No	L_T(mH)	C (F)	Theoretical frequency (KHz)	Practical frequency (KHz)	V_o (peak to peak)
1	10	0.01			
2	10	0.033			
3	10	0.047			

RESULT:

1. For C = 0.01 F, & L_T = 10 mH;
   Theoretical frequency
   = Practical frequency =
2. For C = 0.033 F, & L_T = 10 mH;
   Theoretical frequency =
   Practical frequency =
3. For C = 0.047 F, & L_{Ts} = 10 mH;
   Theoretical frequency =
   Practical frequency =

EXPT NO: 13.A

COLPITTS OSCILLATOR (software)

PRELAB:

Study the operation and working principle Hartley oscillator.

OBJECTIVE:

To design Hartley oscillator using Multisim software and calculate the frequency

APPARATUS:

1. Transistor – BC 107
2. Resistors – 1K, 5K,10K,100K,
3. Capacitors – 100nF(3),10nf
4. RPS
5. CRO
6. Breadboard
7. Connecting wires and probes

SOFTWARE TOOL:

Multisim

CIRCUIT DIAGRAM:

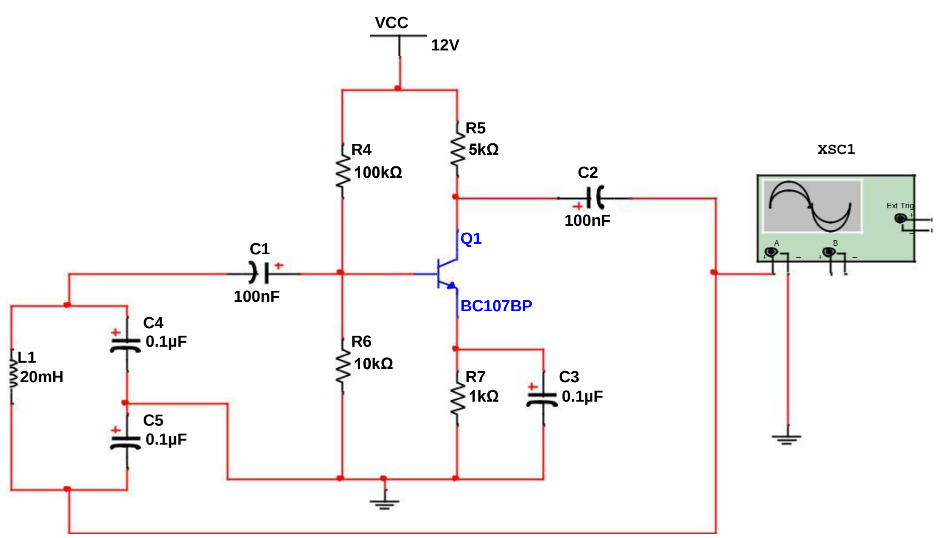
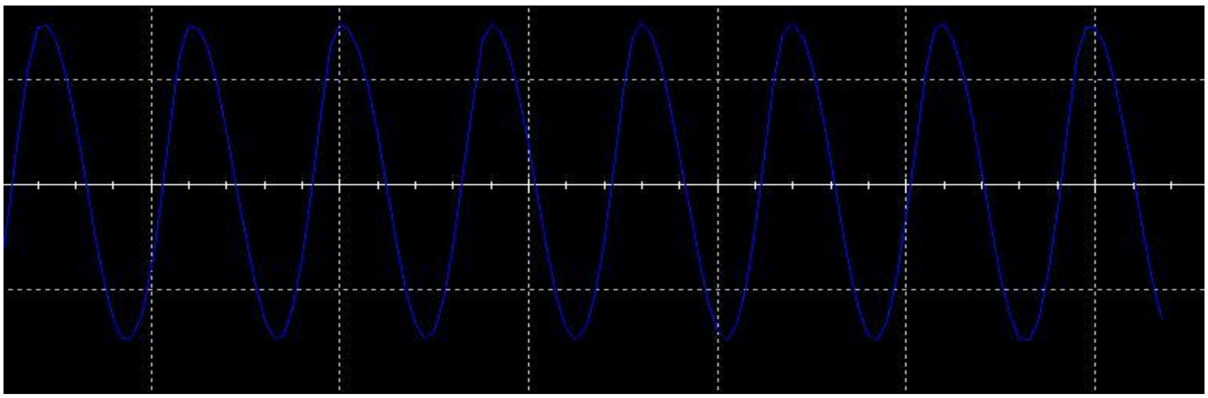


Fig: 12.bHartley oscillator circuit diagram

PROCEDURE:

1. Open Multisim Software to design Colpitts oscillator circuit
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and check the connections and oscillator.
4. Go for simulation and using Run Key observe the output waveforms on CRO
5. Calculate the frequency theoritaly and practically

OBSERVATIONS/GRAPHS:



RESULT: -

1. Out frequency for L1 =10mH, C1=C2=10nf is_________
2. Out frequency for L1 =10mH, C1=C2=100nf is_________
3. Out frequency for L1 =20mH, C1=C2=10nf is_________
4. Out frequency for L1= 10mH, C=10nf , C2=100nf _________

APPLICATIONS:

1. It is used for generation of sinusoidal output signals with very high frequencies.
2. The Colpitts oscillator using SAW device can be used as the different type of sensors such as temperature sensor. As the device used in this circuit is highly sensitive to perturbations, it senses directly from its surface.
3. It is frequently used for the applications in which very wide range of frequencies are involved.

VIVA QUESTIONS:

1. Give the difference between Hartley and colpitts oscillator.
2. Classification of oscillators.
3. Give an example for LC oscillator.
4. Which phenomenon is employed for colpitts oscillator?
5. Give the applications of oscillator.
6. Define barkhausen criteria
7. Which type of feedback is employed in oscillators
8. Give applications for oscillators
9. What is the condition for sustained oscillations
10. Draw an oscillator circuit with feedback network given below.
11. What is the principle behind operation of a colpits oscillator?
12. What are the advantages and disadvantages of *colpits* oscillators?
13. Mention two essential conditions for a circuit to maintain oscillations?
14. Define an oscillator?
15. Define barkhausen criteria
16. Which type of feedback is employed in oscillators
17. Give applications for oscillators
18. What is an Oscillator?
19. Which feedback used in oscillators?
20. Classify oscillators?
21. Which oscillators are AF oscillators?
22. Draw an oscillator circuit with feedback network given below.
23. What is the principle behind operation of a colpitts oscillator?
24. What are the advantages and disadvantages of colpitts oscillators?
25. Mention two essential conditions for a circuit to maintain oscillations?
26. Define an oscillator?
27. Define barkhausen criteria
28. What are RC oscillators?
29. Mention two essential conditions for a circuit to maintain oscillations?
30. Define an oscillator?

EXERCISE PROBLEMS:

1. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
2. Plot the Amplitude response of 2N2222 Oscillator C2 = 5 μF with i/p.
3. Plot the Amplitude response of BC107 Oscillator with R_1 = 4.1 K.
4. Plot the Amplitude response of BC 547 Oscillator with R_2 = 9.4 K i/p.
5. Plot the Amplitude response of BC 548 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the Amplitude response of BC 557 Oscillator with C_1 = 5 μF.
7. Plot the Amplitude response of BC 547 Oscillator with C_2 = 5 μF, i/p.
8. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
9. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
10. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 10 μF.
12. Plot the Amplitude response of CL100 Oscillator with C_2 = 2 μF with i/p.
13. Plot the Amplitude response of CL 100 Oscillator with R_1 = 2.1 K.
14. Plot the Amplitude response of CK 100 Oscillator with R_2 = 5.4 K i/p.
15. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 2 μF.
17. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 2 μF, i/p.
18. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 2.1 K.
19. Plot the Amplitude response of SL100 Oscillator with R_2 = 2.4 K i/p.
20. Plot the Amplitude response of 2N3904 Oscillator R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
22. Plot the Amplitude response of 2N3904 Oscillator with C_2 = 5 μF with i/p.
23. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
24. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
25. Plot the Amplitude response of 2N3904 Oscillator R1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the Amplitude response of 2N3904 Oscillator with C_1 = 5 μF.
27. Plot the Amplitude response of 2N3904 Oscillator C2 = 5 μF, i/p.
28. Plot the Amplitude response of 2N3904 Oscillator with R_1 = 4.1 K.
29. Plot the Amplitude response of 2N3904 Oscillator with R_2 = 9.4 K i/p.
30. Plot the Amplitude response of 2N3904 Oscillator of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 13.B

COLPITTS OSCILLATOR (Hardware)

AIM:

Find practical frequency of Colpitt's oscillator and to compare it with theoretical Frequency for L= 5mH and C= 0.001 F, 0.0022 F, 0.0033 F respectively.

COMPONENTS & EQIUPMENT REQUIRED: -

S.No	Device	Range/Rating	Quantity
1	a) DC supply voltage b) Inductors c) Capacitor d) Resistor e) NPN Transistor	12V 5mH 0.01 F,0.01 F,100 F 1K ,10K ,47K BC 107	1 1 1 1 1
2	Cathode Ray Oscilloscope	(0-20) MHz	1
3.	BNC Connector		1
4	Connecting wires	5A	4

CIRCUIT DIAGRAM:

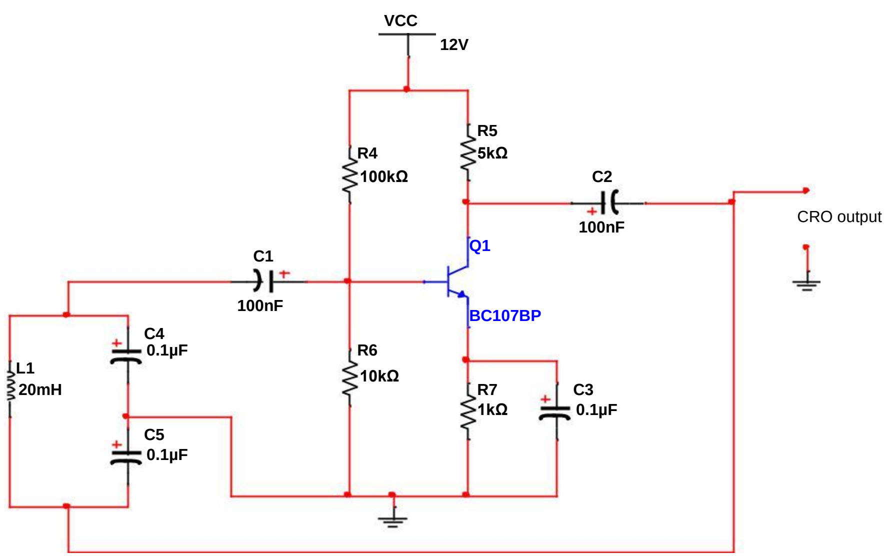


Fig: 12.a Colpitts oscillator circuit diagram

PROCEDURE:-

1. Connect the circuit as shown in the figure
2. Connect C_2= 0.001 Fin the circuit and observe the waveform.
3. Time period of the waveform is to be noted and frequency should be calculated by the formula f=1/T
4. Now, fix the capacitance to 0.002 F and then to 0.003 F and calculate the frequency and tabulate the reading as shown.
5. Find theoretical frequency from the formula $f = \frac{1}{2 \sqrt{LC_T}}$

Where $C_T \; \frac{C_1 C_2}{C_1 C_2}$ and compare theoretical and practical values.

PRECAUTIONS:-

1. No loose connections at the junctions.

TABULAR COLUMN:

S.NO	L(mH)	C_1 (F)	C_2 (F)	C_T (F)	Theoretical Frequency (KHz)	Practical Frequency (KHz)	Vo(V) Peak to peak
1	1mH	.1u	0.1u				
2	1mH	0.01u	0.1u				
3	1mH	0.01	0.0iu				

RESULT:

1. For C=0.01 F, 0.1uf & L= 1mH

   Theoretical frequency =

   Practical frequency =
2. For C=0.1 F, 0.1uf & L= 1mH

3. For C=0.01 F, 0.01uf & L= 5mH

   Theoretical frequency =

   Practical frequency =

EXPT NO: 14.A

SINGLE TUNED Voltage AMPLIFIER (Software)

PRELAB:

Study the operation and working principle Tuned amplifier.

OBJECTIVE:

To design single tuned amplifier using Multisim software and calculate the frequency response and bandwidth Apparatus:

1. Transistor – BC 107
2. Resistors – 2K(2), 4.7K
3. Capacitors – 10nF(2)
4. RPS
5. CRO

SOFTWARE TOOL: Multisim V 13.0

CIRCUIT DIAGRAM:

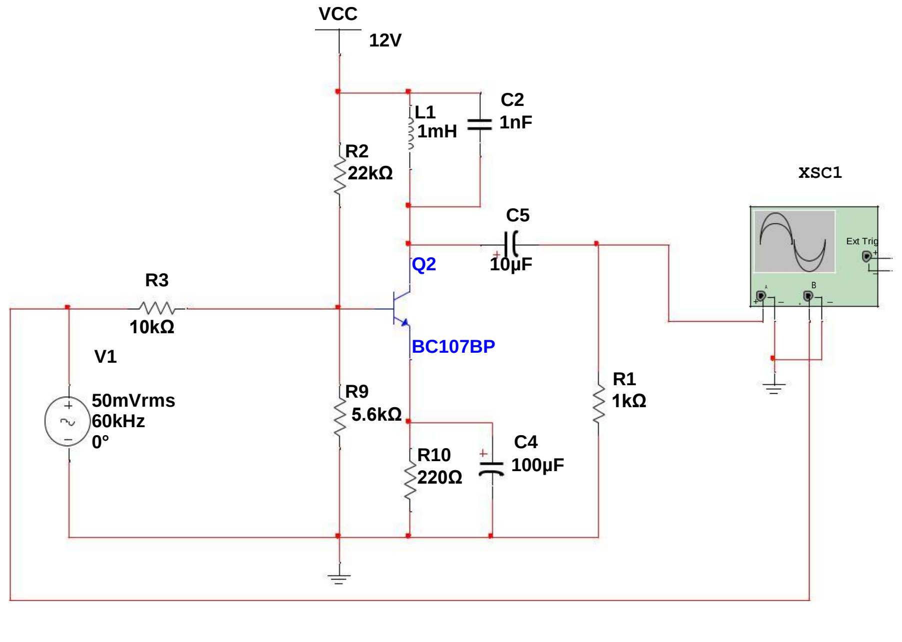
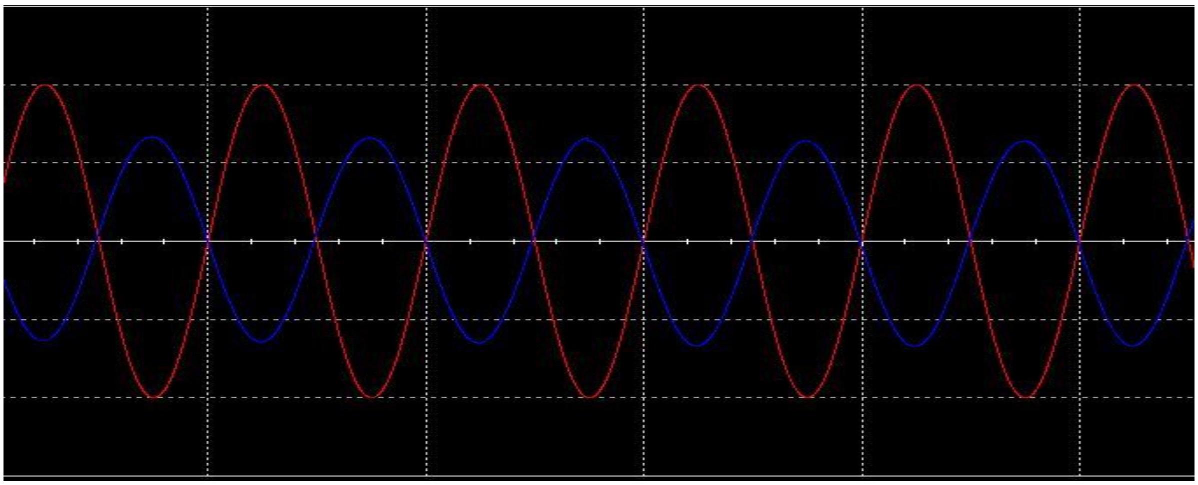


Fig: 14.aSingle Tuned amplifier circuit diagram

PROCEDURE:

1. Open Multisim Software to design circuit
2. Select on New editor window and place the required component on the circuit window.
3. Make the connections using wire and check the connections and oscillator.
4. Go for simulation and using Run Key observe the output waveforms on CRO
5. Indicate the node names and go for AC Analysis with the output node
6. Observe the Ac Analysis and draw the magnitude response curve
7. Calculate the bandwidth of the amplifier

OBSERVATIONS/GRAPHS:



RESULT: -

1. Frequency response of single tuned Amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.

APPLICATIONS:

(a) Intermediate frequency (IF) amplifier in a super heterodyne receiver;

(b) very narrow-band IF amplifier in a spectrum analyzer;

(c) IF amplifier in a satellite transponder;

(d) RF amplifiers in receivers;

(e) wide-band tuned amplifiers for video amplification;

(f) wide-band tuned amplifiers for Y-amplifiers in oscilloscopes;

(g) UHF radio relay systems.

VIVA QUESTIONS:

1. What is a tuned amplifier?
2. Difine Q-factor?
3. What is selectivity?
4. Is tuned amplifier a hallow band or wide band amplifier?
5. give the applications for tuned amplifier?
6. Is tuned amplifier a hallow band or wide band amplifier?
7. What is the type of capacitor used in RC coupled amplifier for a) coupling two phases b)by pass emitter
8. What is signal source used for experiment of an RC coupled amplifier and how much maximum voltage it could give
9. What is the pin configuration on bread board used in the lab
10. How do you determine AC power output in class A amplifier i.e., do you measure current or voltage and how
11. How much current do you pass through reference zener in series regulated power supply experiment
12. In shunt regulator how is the value of resistor between base and emitter of shunt transistor determined
13. How do you determine Q of oil used in tuned amplifier experiment
14. What is a tuned amplifier
15. Difine Q-factor
16. What is selectivity?
17. Is tuned amplifier a hallow band or wide band amplifier
18. give the applications for tuned amplifier
19. Is tuned amplifier a hallow band or wide band amplifier
20. What is the type of capacitor used in RC coupled amplifier for a) coupling two phases b)by pass emitter
21. What is signal source used for experiment of an RC coupled amplifier and how much maximum voltage it could give
22. What is the pin configuration on bread board used in the lab
23. How do you determine AC power output in class A amplifier i.e., do you measure current or voltage and how
24. How much current do you pass through reference zener in series regulated power supply experiment
25. In shunt regulator how is the value of resistor between base and emitter of shunt transistor determined
26. How do you determine Q of oil used in tuned amplifier experiment
27. What is the type of capacitor used in RC coupled amplifier for a) coupling two phases b)by pass emitter
28. What is signal source used for experiment of an RC coupled amplifier and how voltage it could give?
29. What is the pin configuration on bread board used in the lab
30. How do you determine AC power output in class A amplifier i.e., do you measure current or voltage and how?

EXERCISE PROBLEMS:

1. Plot the frequency response of BC 107 amplifier with C_1 = 5 μF.
2. Plot the frequency response of BC 547 amplifier with C_2 = 5 μF with i/p.
3. Plot the frequency response of BC 2N2222 amplifier with R_1 = 4.1 K.
4. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
5. Plot frequency response of BC 107 amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
6. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
7. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
8. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
9. Plot the frequency response of BC107 amplifier with R_2 = 9.4 K i/p.
10. Plot frequency response of BC107 R1 = 4.1 K, R_2 = 9.4 K with i/p.
11. Plot the frequency and amplitude response of BC107 amplifier with C_1 = 10 μF.
12. Plot the frequency response of BC 107amplifier with C_2 = 2 μF with i/p.
13. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
14. Plot the frequency response of BC 10 7amplifier with R_2 = 5.4 K i/p.
15. Plot frequency response of BC 107amplifier R_1 = 2.1 K, R_2 = 2.4 K with i/p.
16. Plot the frequency and amplitude response of BC 107amplifier with C_1 = 2 μF.
17. Plot the frequency response of amplifier with C_2 = 2 μF, i/p.
18. Plot the frequency response of BC 107 amplifier with R_1 = 2.1 K.
19. Plot the frequency response of BC 107 amplifier with R_2 = 2.4 K i/p.
20. Plot frequency response of R1 = 2.1 K, R_2 = 9.4 K with i/p.
21. Plot the frequency response of BC 107 amplifier with C_1 = 5 μF.
22. Plot the frequency response of BC 107 amplifier with C_2 = 5 μF with i/p.
23. Plot the frequency response of BC 107 amplifier with R_1 = 4.1 K.
24. Plot the frequency response BC 107 amplifier with R_2 = 9.4 K i/p.
25. Plot frequency response of BC 107amplifier R_1 = 4.1 K, R_2 = 9.4 K with i/p.
26. Plot the frequency and amplitude response of BC 107 amplifier with C_1 = 5 μF.
27. Plot the frequency response of amplifier with C_2 = 5 μF, i/p.
28. Plot the frequency response of BC107 amplifier with R_1 = 4.1 K.
29. Plot the frequency response of BC 107 amplifier with R_2 = 9.4 K i/p.
30. .Plot frequency response of R_1 = 4.1 K, R_2 = 9.4 K with i/p

EXPT NO: 14.B

SINGLE TUNED VOLTAGE AMPLIFIER (Hardware)

AIM: -
Plot the frequency response of a single tuned amplifier.
Calculate gain.
Calculate bandwidth.

COMPONENTS & EQUIPMENTS REQUIRED: -

S.No	Device	Range/Rating	Qty
1.	(a) DC supply voltage (b) BJT (c) Capacitors (d) Resistors (e) inductor (1mH)	12V BC107 10 F 100 F 220 ,22K ,1k 5.6K ,10k	1 1 2 1 1 1
2.	Signal generator	0.1Hz-1MHz	1
3.	CRO	0Hz-20MHz	1
4.	Connecting wires	5A	4

CIRCUIT DIAGRAM:

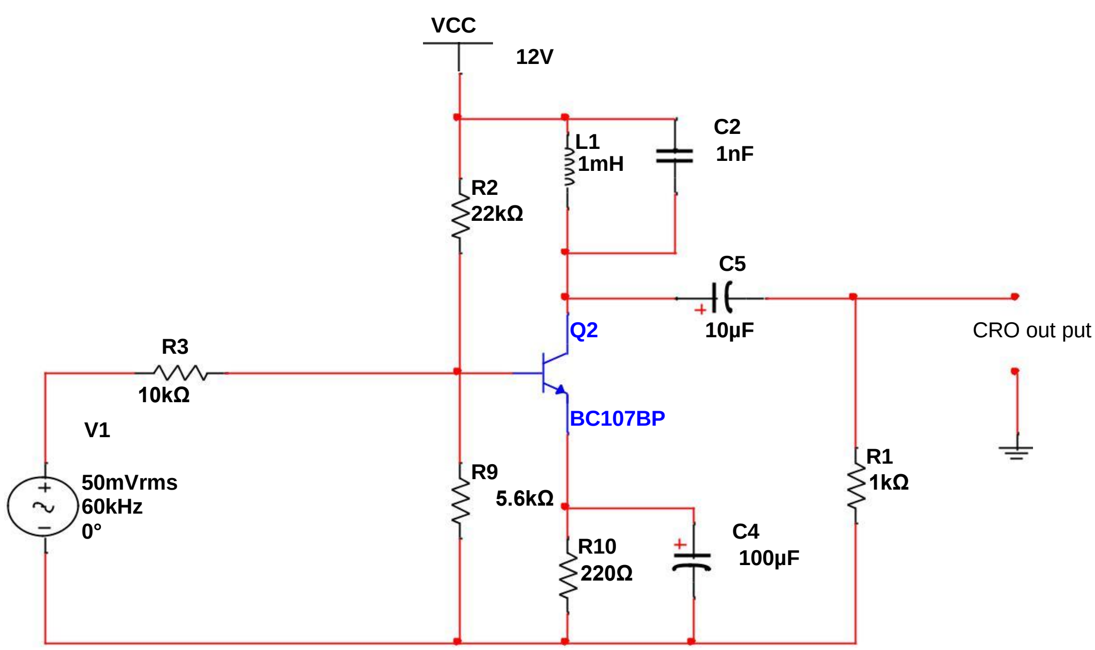


Fig: 14.b Single Tuned amplifier circuit diagram

PROCEDURE: -

1. Connect the circuit diagram as shown in figure.
2. Set the input signal amplitude in the function generator and observe an amplified voltage at the output without distortion.
2. By keeping input signal voltage, say at 50mV, vary the input signal frequency from 0 to 1MHz in steps as shown in tabular column and note the corresponding output voltages.

PRECAUTIONS:

1. Avoid loose connections and give proper input Voltage

TABULAR COLUMN:

Input = 50mV

Frequency (in Hz)	Output Voltage (V_o)	Gain $A_v=V_o/V_i$	Gain (in dB) = $20\log_{10}(V_o/V_i)$
20			
40			
80			
100			
500			
1000			
5000			
10K			

RESULT: -

1. Frequency response of single Tuned voltage amplifier is plotted.
2. Gain = _______dB (maximum).
3. Bandwidth= f_H-f_L = _________Hz.