VINAYAKA MISSION'S RESEARCH FOUNDATION

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY

DEPARTMENT : **ECE & BME**

NAME OF THE SUBJECT : **Analog Circuits Lab (17ECCC83)**

REGULATION : **2017**

HOD/ ECE

<u>**LIST OF EXPERIMENTS**</u>

A) TESTING IN THE HARDWARE LABORATORY:

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1. TWO STAGE RC COUPLED AMPLIFIER.
2. RC PHASE SHIFT OSCILLATOR USING TRANSISTORS.
3. CLASS A POWER AMPLIFIER.(SERIES FED)
4. CLASS B COMPLEMENTARY SYMMETRY AMPLIFIER.
5. CURRENT SHUNT FEEDBACK AMPLIFIER.
6. SINGLE TUNED VOLTAGE AMPLIFIER.
7.HARTELY OSCILLATOR
8.VOLTAGE SERIES FEED BACK AMPLIIER
9.CLASS –A TRANSORMER COUPLED POWER AMPIFIER
10.CLASS-B PUSHPULL POWER AMPLIFER

B) DESIGN AND SIMULATION USING PSPICE SOTWARE:

1. TWO STAGE RC COUPLED AMPLIFIER.
2. RC PHASE SHIFT OSCILLATOR USING TRANSISTORS.
3. CLASS B COMPLEMENTARY SYMMETRY AMPLIFIER
4.WEIN BRIDGE OSCILLATOR
5. CLASS A POWER AMPLIFIER.(SERIES FED)
6. SINGLE TUNED VOLTAGE AMPLIFIER.
7. CLASS –A TRANSORMER COUPLED POWER AMPIFIER
8.VOLTAGE SERIES FEED BACK AMPLIIER
9. CURRENT SHUNT FEEDBACK AMPLIFIER.
10.CLASS-B PUSHPULL POWER AMPLIFER

1. TWO STAGE RC COUPLED AMPLIFIER

AIM: To obtain the Voltage gain for two stage RC coupled Amplifier and also to observe the frequencyResponse.
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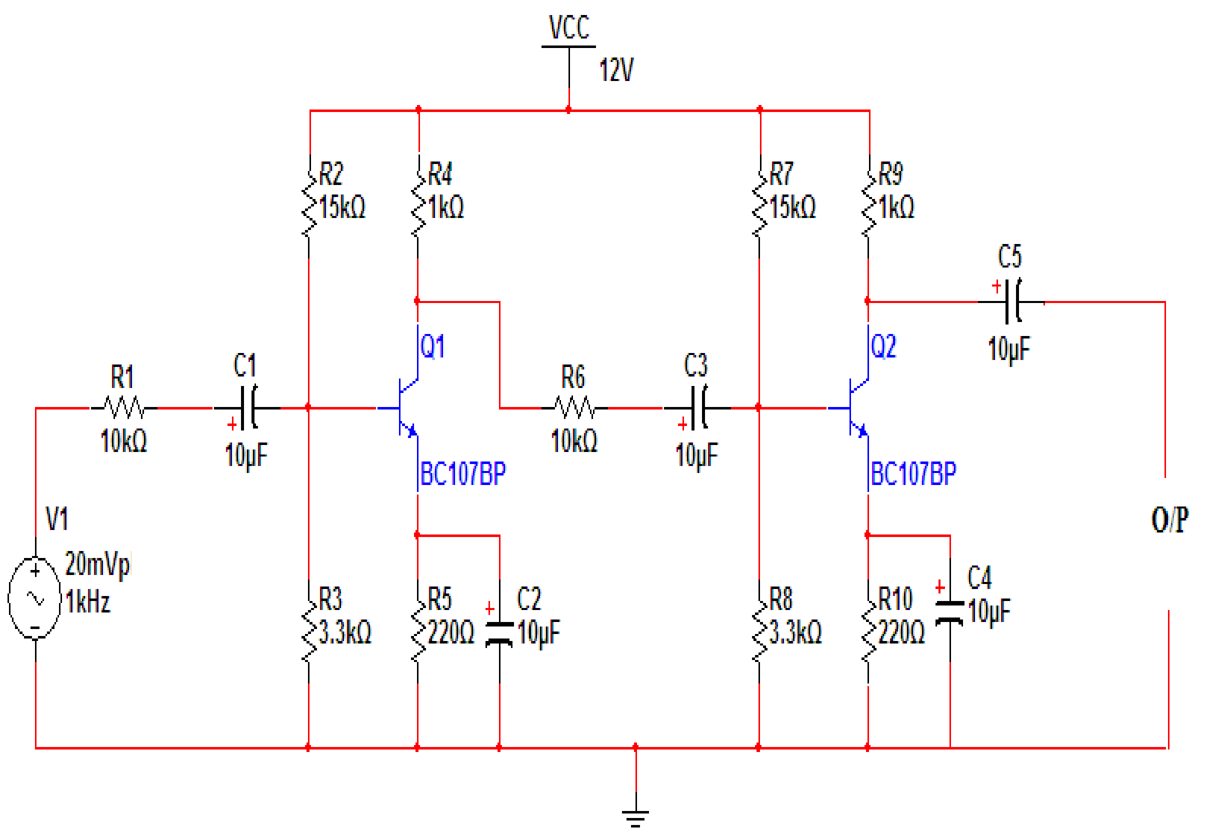
EQUIPMENT REQUIRED:

1. cathode ray oscilloscope 1No
2. Regulated power supply 1No
3. function generator 1No
4. bread board 1No
5. connecting wires

COMPONENTS REQUIRED:

1. Resistors:
   - 15k-2no
   - 10k-2no
   - 1k-2no
   - 3.3k-2no
   - 220Ω-2no
2. Transistor :BC107-2no
3. Capacitors-10µf -5no

CIRCUIT DIAGRAM:



THEORY: Whenever large amplification with very good impedance matching is required using an active device such as a transistor or a field effect transistor a single active device and its associated circuitry will not be able to cater to the needs. In such a case single stage amplifier is not sufficient and one requires more stages of amplification i.e., output of one stage is connected to the input of second stage of amplification circuit and the chain continues until the required characteristics of amplifier is achieved such an amplifier is called as multistage amplifier.In multistage amplifier, the output signal preceding stage is to be coupled to the input circuit of succeeding stage. For this interstage coupling different types of coupling can be employed. They are

1. RC coupling
2. Transformer coupling
3. Direct coupling

RC coupling is most popularly used type of coupling because it is cheap and provides excellent fidelity over a wide range of frequency .it is usually employed for voltage.

PROCEDURE:

1) Connect the circuit as shown in the figure.
2) Apply 1Khz frequencyand 20mv Vp-p Sine wave from function generator..
3) Observe input and output Waveforms simultaneously on C.R.O
4) Change the frequency of input signal from 10HZ to 1MHZ in steps and note amplitudes of input and output Waveforms(input signal should be maintained constant).
5) Calculate Voltage gain (A) for each (in db) verses frequency.

Observations:

S.No	Frequency (Hz)	Input Voltage	Output Voltage	Gain=(V_0/V_i)	Gain in db= $20 \times \log_{10} (V_0/V_i)$

PRECAUTIONS:

1. Check connections before switching ON power supply.
2. Don’t apply over voltage
3. When you are not using the equipment switch them Off

CALCULATIONS:

Maximum gain of the amp:

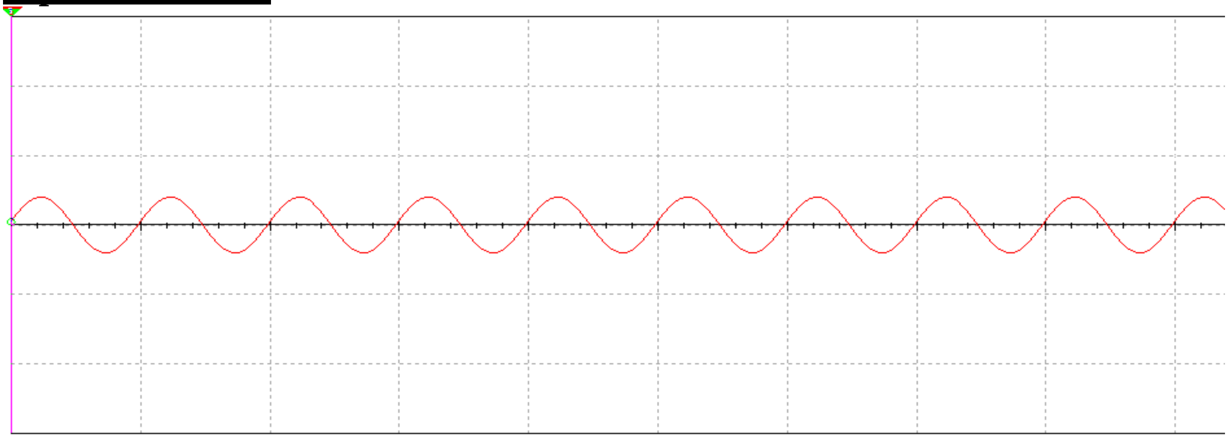
Upper cutoff frequency F2:

Lower cutoff frequency F1:

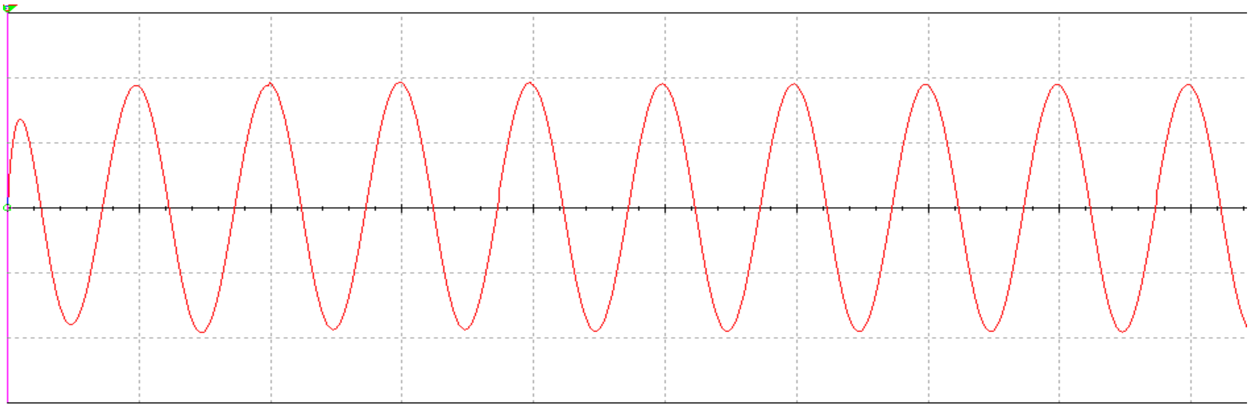
Band width=F2-F1:

EXPECTED GRAPH:

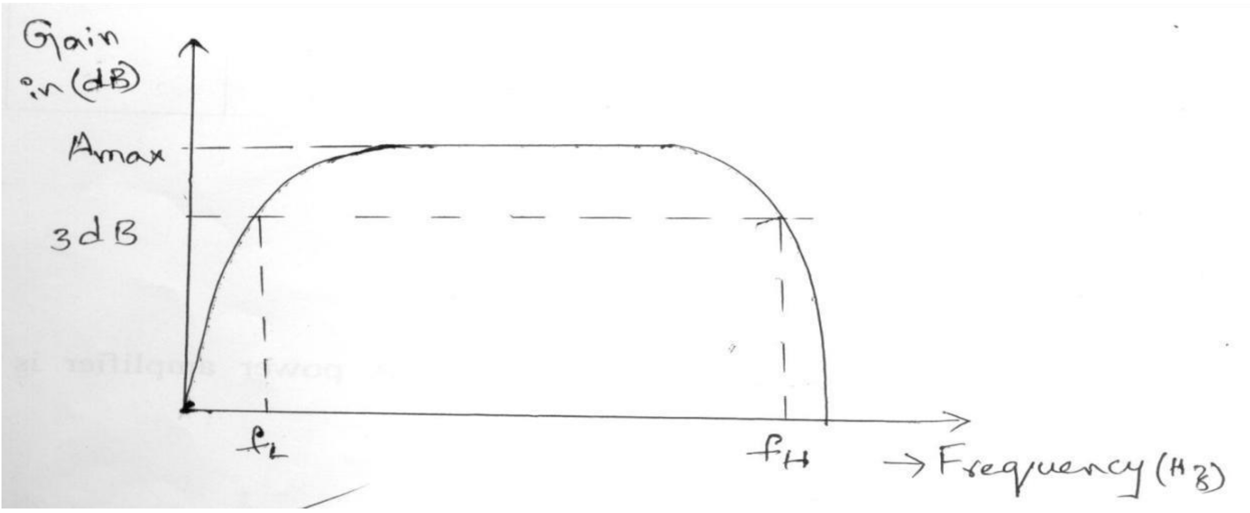
Input wave form



Output waveform



Frequeny response:



RESULT: -

1. Frequency response of Two stage RC coupled amplifier is plotted.
2. Gain =________dB (maximum).
3. Bandwidth= fH--fL =__________Hz. At stage 2

2. RC PHASE SHIFT OSCILATOR USING TRANSISTORS

AIM: To calculate the frequency of the RC phase shift oscillator & to measure the phase angles at different RC sections.

APPARATUS:

1. Transistor BC107
2. Resistors: 10KΩ -3Nos
   8KΩ or 10KΩ
   22KΩ
   1.2KΩ
   100KΩ
3. Capacitors: 0.001µf – 3 Nos
   10µF – 2Nos
   1µf
4. Regulated power Supply
5. CRO

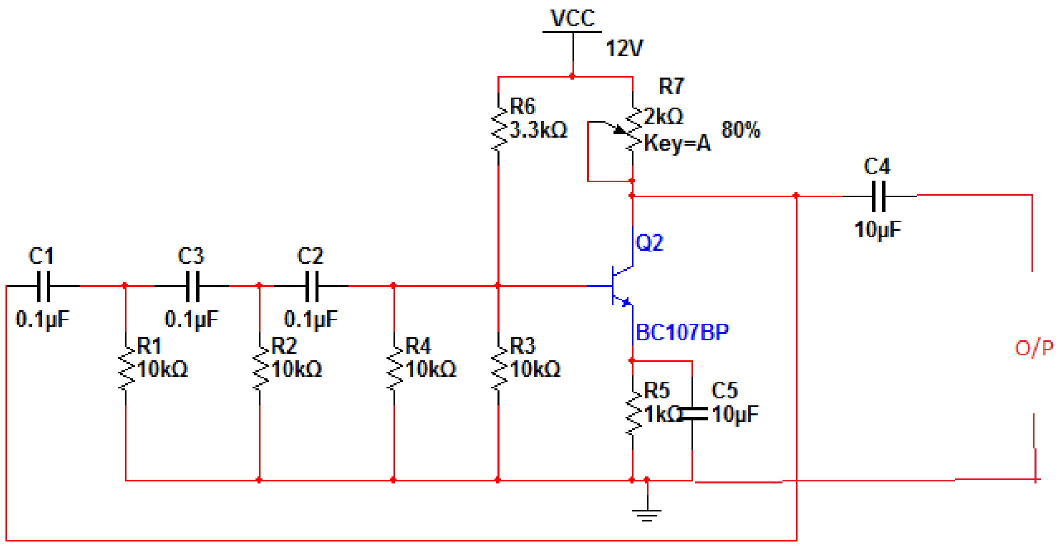
THEORY:

RC-Phase shift Oscillator has a CE amplifier followed by three sections of RC phase shift feedback Networks the output of the last stage is return to the input of the amplifier. The values of R and C are chosen such that the phase shift of each RC section is 60º.Thus The RC ladder network produces a total phase shift of 180º between its input and output voltage for the given frequencies. Since CE Amplifier produces 180 º phases shift the total phase shift from the base of the transistor around the circuit and back to the base will be exactly 360º or 0º. This satisfies the Barkhausen condition for sustaining oscillations and total loop gain of this circuit is greater than or equal to 1, this condition used to generate the sinusoidal oscillations.

The frequency of oscillations of RC-Phase Shift Oscillator is,

$$f = \frac{1}{2\pi RC * \sqrt{6}}$$

CIRCUIT DIAGRAM:



PROCEDURE:

1. Make the connection as per the circuit diagram as shown above.
2. Observe the output signal and note down the output amplitude and time period (T_d).
3. Calculate the frequency of oscillations theoretically and verify it practically ($f=1/T_d$).
4. Calculate the phase shift at each RC section by measuring the time shifts (T_p) between the final waveform and the waveform at that section by using the below formula.

OBSERVATIONS:

THEORITICAL CALCULATIONS: R = 10KΩ, C = 0.001 µf

$$f = \frac{1}{2\pi RC^* \sqrt{6}} =$$

PRACTICAL CALCULATIONS:

T_d =

$$f = \frac{1}{T_d}$$

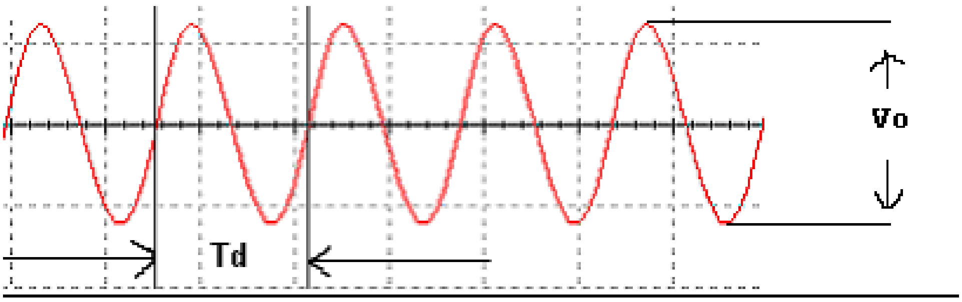
$$(1).\ \theta_1 = \frac{Tp_1}{T_d} * 360^0 =$$

$$(2).\ \theta_2 = \frac{Tp_2}{T_d} * 360^0 =$$

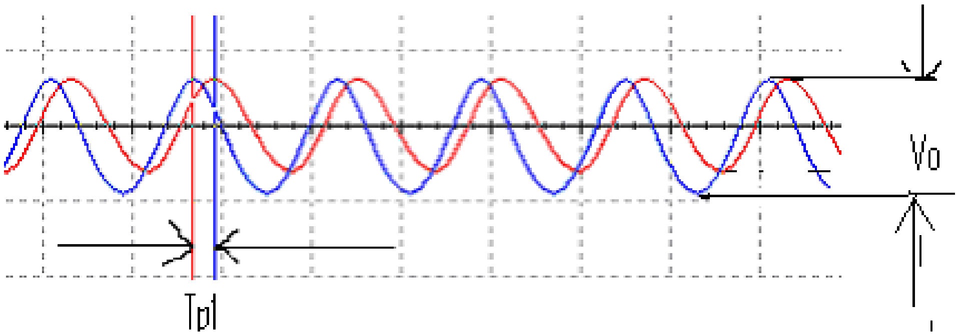
$$(3).\ \theta_3 = \frac{Tp_3}{T_d} * 360^0 =$$

MODEL WAVE FORMS:

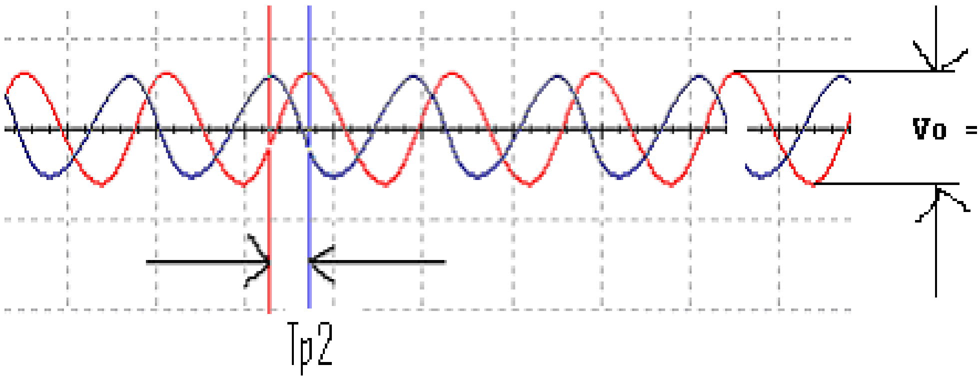
OUT PUT WAVE FORM :



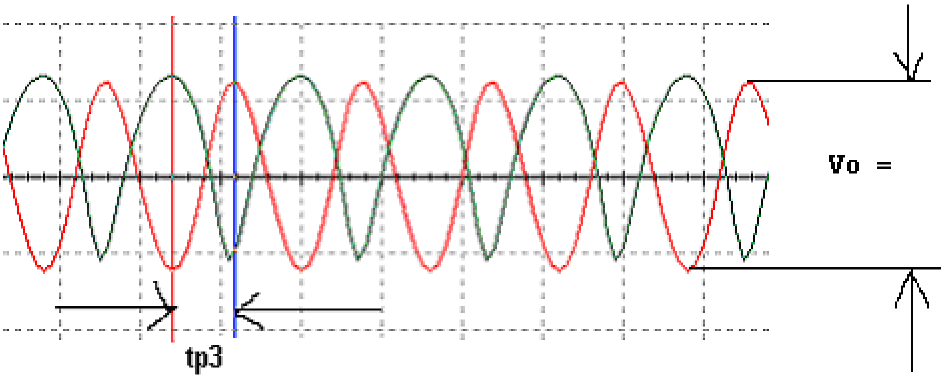
OUT PUT WAVE FORM : θ = 60^0



OUT PUT WAVE FORM : θ = 120^0



OUT PUT WAVE FORM : θ = 180



RESULT: The frequency of RC phase shift oscillator is calculated and the phase shift at different RC sections is noted.

F_T = F_P =

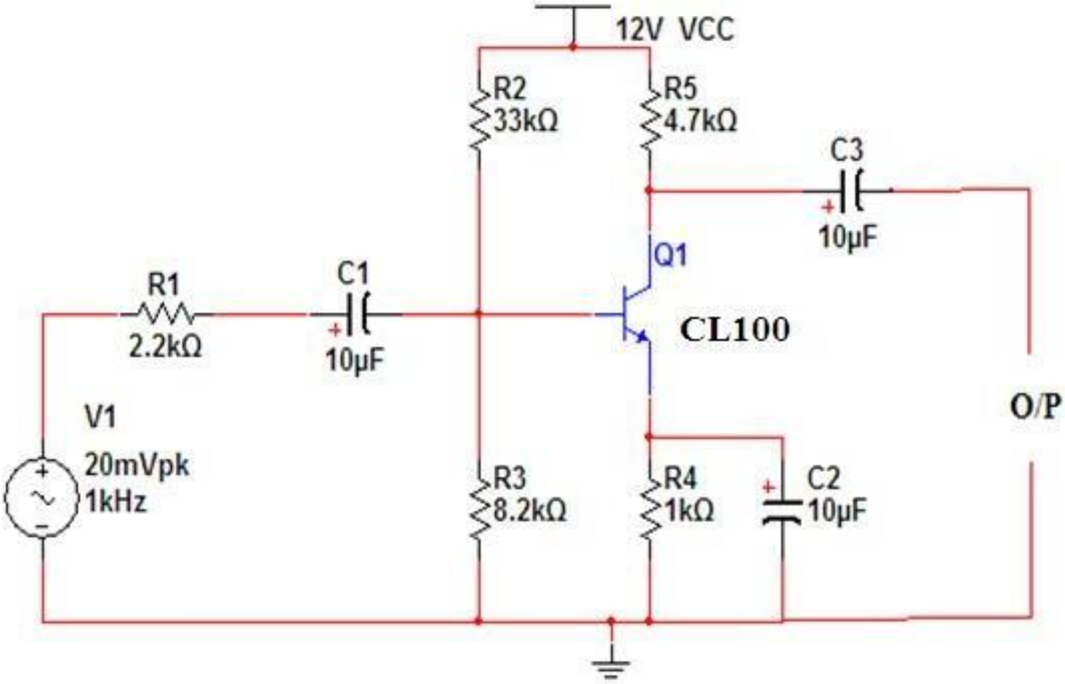
3.CLASS A POWER AMPLIFIER(SERIES FED)

AIM: To design and test the class A power amplifier

APPARATUS:

1. Class A power amplifier trainer kit
2. Function Generator
3. CRO
4. BNC Probes and connecting wires

CIRCUIT DIAGRAM:



THEORY:

The amplifier is said to be class A power amplifier if the q point and the input signal are selected such that the output signal is obtained for a full input cycle. For this class the position of q point is approximately y at the midpoint of the load line. For all the values of input signal the transistor remains in the active region and never entire into the cutoff or saturation region. The collector current flows for 3600 (life cycle) of the input signal in other words the angle of the collector current flow is 3600 the class a amplifiers or furthers classified as directly coupled and transformer coupled and transformer coupled amplifiers in directly coupled type .The load is directly connected in the collector circuit while in the transformer coupled type, the load is coupled to the collector using the transformer.

Advantages:

1. Distortion analysis is very important

2. It amplifies audio frequency signals faithfully hence they are called as audio amplifiers

Disadvantages:

1. H parameter analysis is not applicable
2. Due to large power handling the transistor is used power transistor which is large in size and having large power rating.

PROCEDURE:

1. Switch ON Class –A power amplifier trainer
2. Set Vs (say 250 to 300 mV), at 10 KHz using signal generator.
3. Connect milli ammeter to the ammeter terminals
4. By keeping the input voltage constant, vary the frequency from 0 to 1MHz

   in regular steps .
5. Note down the corresponding output voltage from CRO
6. Calculate the DC input power using the formula $Pdc = V_{cc}I_c$
7. Calculate the AC output power using the formula $Pac = V_O^2/8R_L$
8. Calculate the efficiency η = Pac /Pdc
9. Plot the graph between Gain (db) and frequency.
10. Calculate bandwidth from the graph.

PRECAUTIONS:

1. Check connections before switching ON power supply
2. Don’t apply over voltage
3. When you are not using the equipment switch them OFF.
4. Handle all equipment carefully.

CALCULATIONS:

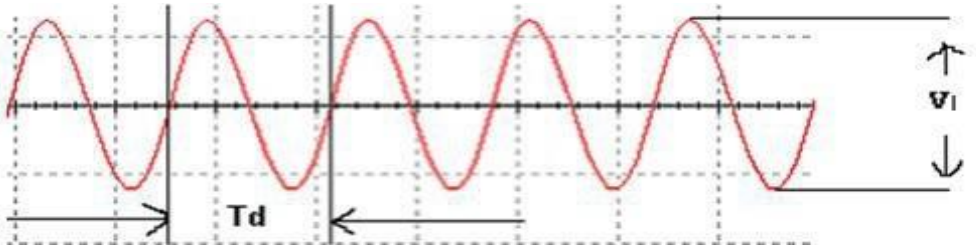
Input power: $Pdc = V_{cc}I_c =$

Outpower: $Pac = VPP^2/8R_L =$

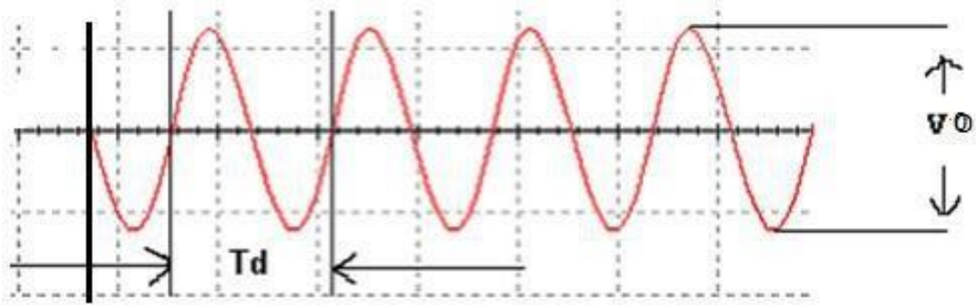
η = Efficiency=output power/input power*100 = Pac /Pdc*100 =

EXPECTED GRAPH:

I/P:



O/P:



RESULT: Gain and frequency as observed of Class A power amplifier.

η = Efficiency=output power/input power*100 = Pac /Pdc*100 =

4. CURRENT SHUNT FEEDBACK AMPLIFIER

AIM: To observe the performance of a current shunt feedback amplifier and obtain its bandwidth.

EQUIPMENT ROUIRED:

Power supply 0-30V- 1 No.
CRO 20MHz - 1 No.
Digital multimeter - 1 No.
Signal generator 1Hz - 1MHz - 1 No.

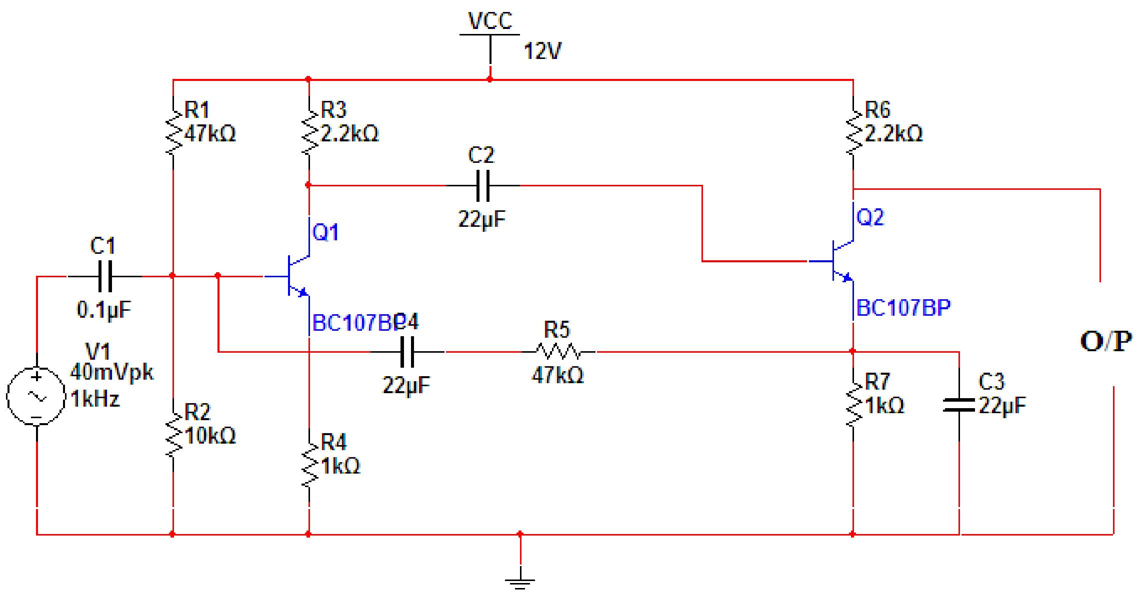
COMPONENTS:

Resistors : 47KΩ - 2 Nos.
2.2KΩ - 2 Nos.
1KΩ - 2 No
10KΩ - 1No.
Capacitors 22μF - 3Nos.
0.1μF - 1No.
Transistors BC 107-2No.

THEORY:

Current shunt feedback circuit shows two transistor in cascade with feedback from the second emitter to the first base through the resistor R_F. we verify that this connection produces negative feedback. The voltage V_{i2} is much larger than V_{i1} because of the voltage gain of Q_1. Also V_{i2} is 180^0 out of phase with V_{i1}. Because of emitter follower action V_{e2} is only slightly smaller than V_{i2}, and these voltages are in phase. Hence V_{e2} is larger in magnitude than V_{i1} and is 180^0 out of phase with V_{i1}. If the input signal increases so that I_S increases, If also increases, and $I_i = I_S - I_f$ is smaller than it would be their were no feedback. This action is characteristics of negative feedback.

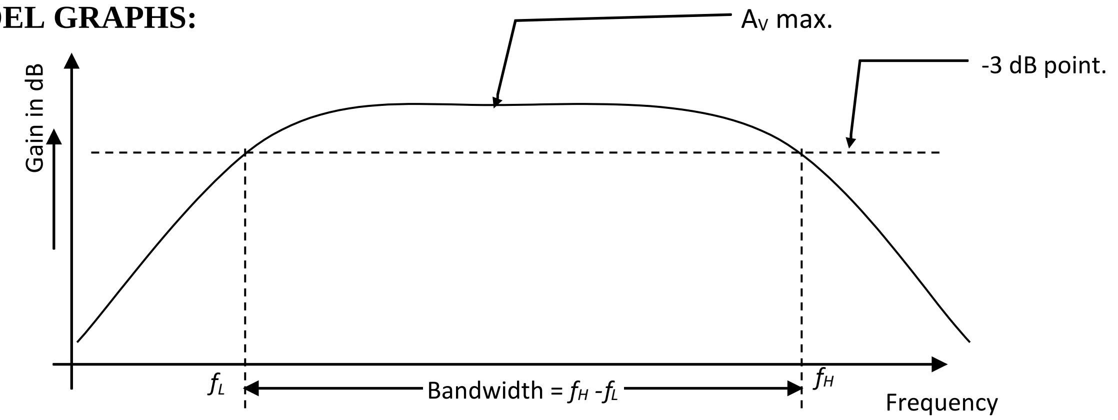
CIRCUIT DIAGRAM:



PROCEDURE:

1. Connect the circuit as shown in the figure
2. The operating points V_{CEQ} , $I_{EQ}$and V_{BE} are measured.
3. Connect the signal generator with a sine wave of 1KHz frequency to the input and increase the input to such a level that the output waveform of the signal as observed on CRO is not distorted.
4. Measure the input and output voltages and calculate the gain of the amplifier. Av = ($V_{O/P}$ / $V_{I/P}$).
5. To measure the input impedance, find the voltage drop across the known resistance $R_{S.}$ The input current therefore is measured as the voltage across Rs / Rs value. Input impedance Zi = Vi / Ii
6. To measure the input impedance, measure the output signal voltage $V_{O/P}$ without any load. Connect a resistive load and then adjust the load until the new output signal $V_{O/P}$ equal to the one half of the original signal. Remove the R_{OUT} from the circuit and measure its value. The measured value is the output impedance of the circuit.
7. To measure the current gain $A_{I,}$ note down the output signal voltage when Ro is connected and divide it by Ro to get the output current. Now current gain = output current / input current. The power gain is the product of voltage gain and current gain.
8. Vary the frequency of the input signal from 50Hz to 1MHz in suitable steps and calculate gain at each step. Plot the graph between voltage gain Vs frequency. Note down the half power points and find the bandwidth of the amplifier.
9. Repeat the above steps by connecting (disconnecting) the emitter bypass capacitor C_E. The readings with C_E give the response of the amplifier without out feedback. The readings without the C_E give the performance of the amplifier in current series feedback mode.

MODEL GRAPHS:



Tabulation:

Without feedback:

S.No	Frequency (Hz)	Input Voltage	Output Voltage (V)	Gain(V_0/V_i)	$20 \times \log_{10} (V_0/V_i)$

With feedback:

S.No	Frequency (Hz)	Input Voltage	Output Voltage (V)	Gain(V_0/V_i)	$20 \times \log_{10} (V_0/V_i)$

RESULTS:

Without feedback

Input voltage (V_i) =

Input frequency =

Output voltage (V_0) =

Voltage gain =

Gain in dB = ($20\times\log_{10}(V_0/V_i)$ =

With feedback

Input voltage (V_i) =

Output voltage (V_0) =

Voltage Gain =

Gain in dB = ($20\times\log_{10}(V_0/V_i)$ =

CONCLUSIONS:

Conclusions can be drawn on comparing the voltage gain of the amplifier with and without feedback, bandwidth obtained from the frequency response plot.

1. SINGLE TUNED VOLTAGE AMPLIFIER

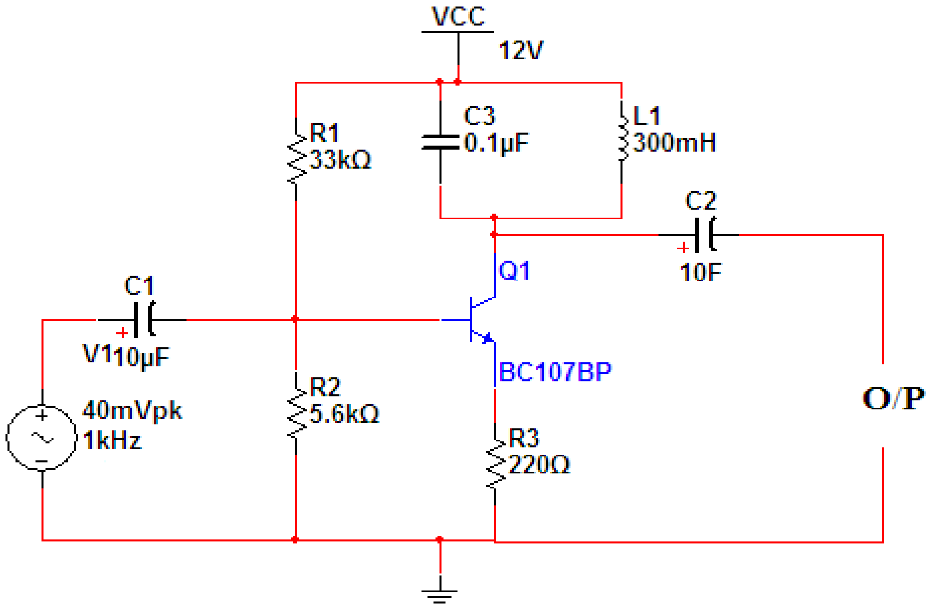
AIM: To study single tuned voltage Amplifier and to calculate

1. Resonant Frequency.
2. Q factor.
3. Bandwidth and
4. Impedance

APPARATUS:

1. Tuned RF Amplifier trainer Kit.
2. Function Generator.
3. CRO.
4. BNC probes and connecting wires

CIRCUIT DIAGRAM:



THEORY:

It is usually required to use a number of tuned amplifier stages in cascade in order to obtain large overall gain. These cascade tuned amplifiers may be put into the following three categories:

1. Single tuned amplifiers.
2. Double tuned amplifiers.
3. Stagger-tuned amplifiers.

Single tuned amplifiers use one parallel tuned circuit as the load impedance in each stage and all these tuned circuits in different stages are tuned to the same frequency.Double tuned amplifier uses two inductively coupled tuned circuits per stage, both the tuned circuits being tuned to the same frequency.Staggered tuned amplifier uses a number of single tuned stages in cascade, the successive tuned circuits being tuned to slightly different frequencies.
Single tuned amplifiers may again be put into following two categories:

a) Capacitance coupled single tuned amplifiers and

b) Transformer coupled or inductively coupled single tuned amplifiers

RESONANT FREQUENCY:

Depending upon the frequency of the source voltage Vs, the circuits may behave either as inductive or capacitive. However, at a particular frequency when the inductive reactance Xl equals the capacitive reactance Xc, then the circuit behaves as a purely resistive circuit. This phenomenon is called resonance: and the corresponding frequency is called resonant frequency. The resonant frequency (fr) can be found by equating the two reactance values.

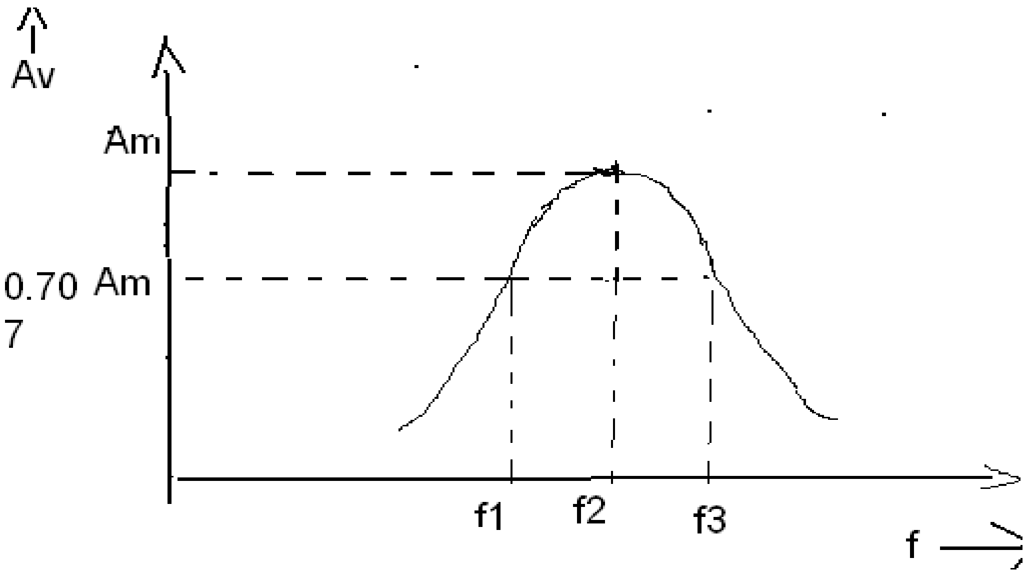
PROCEDURE:

1. Connect ions should be made as per the circuit diagram.
2. Connect the AC signal source from function generator (above AF range) to input of the trainer kit.
3. Keep the input voltage constant , vary the frequency in regular steps and down the corresponding output voltage
4. Calculate the resonant frequency.
5. Plot the graph: gain (db) Vs frequency
6. Find the input and output impedance
7. Calculate the bandwidth and Q factor

PRECAUTIONS:

1. Check connections before switching ON power supply
2. Don't apply over voltage
3. When you are not using the equipment switch them OFF.
4. Handle all equipment carefully

EXPECTED GRAPH:



Observations:

Input Voltage= (Constant)

S.NO	Input Frequency (Hz)	OutputVoltage(V_o)	Gain A = V_o/V_i	Gain in dB 20log(V_o/V_i)

RESULT: Gain and frequency as observed of single tuned voltage amplifier.

F_T = F_P=

7.CLASS B COMPLEMENTARY SYMMETRY AMPLIFIER

AIM: To observe the input and output waveforms and to calculate the efficiency of Class B Complimentary symmetry power amplifier.

APPARATUS:

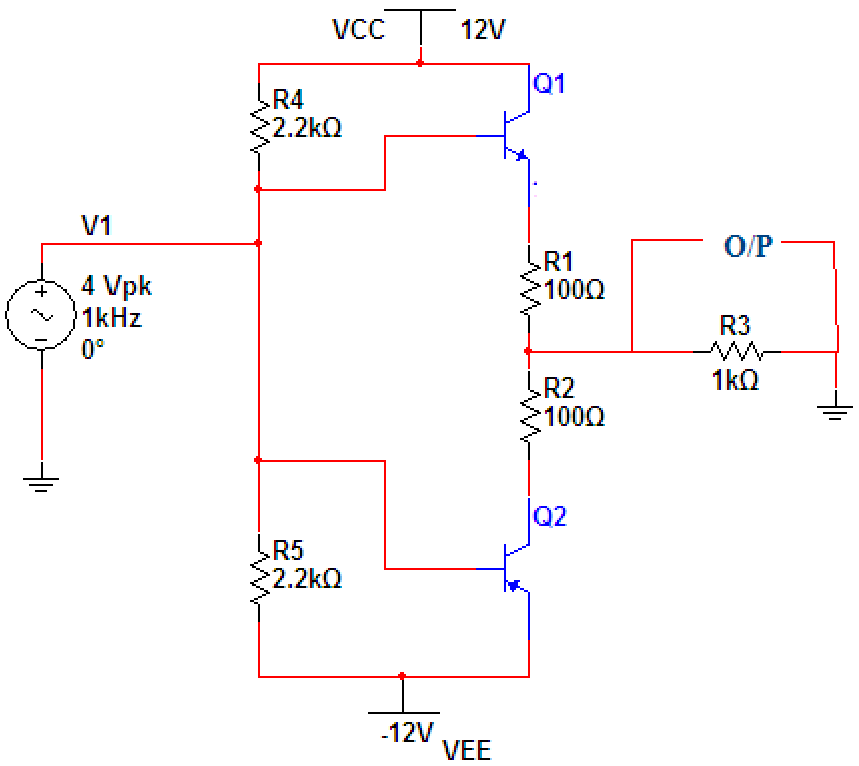
EQUIPMENT REQUIRED:

Power supply 0-30V- 1 No.
CRO 20MHz - 1 No.
Digital multimeter - 1 No.
Signal generator 1Hz - 1MHz - 1 No.

COMPONENTS:

Resistors : 2.2KΩ - 2 Nos.
100Ω - 2 Nos.
1KΩ - 1 No
Transistors CL100- 1No , CK100 -1NO

CIRCUIT DIAGRAM:



THEORY:

An amplifying system consists of several stages in cascade. The input and the intermediate stages amplify small signal excitations to a value large enough to drive the final device .The out put stage feeds the final device .The output stage feeds a transducer such as a CRO,loudspeaker or servomotor. Thus the final stage must be capable of delivering a large voltage or current or appreciable amount of power. This requires an amplifier which is referred as a power amplifier

In class B complimentary symmetry class _B amplifier one n-p-n and p-n-p is used. Hence the circuit is called class-B complimentary symmetry amplifier. This circuit ifis transformer less circuit .But with common emitter configuration it becomes power transfer without output impedance for maximum power transfer without an output transformers. Hence the matched pair of complementary transistors are used in common collector configuration This is because in common collector configuration has lowest output impedance and hence the impedance matching is possible.

PROCEDURE:

1.conncet the circuit s per the circuit diagram
2.apply 4v p-p with 1KHZ frequency using function generator
3.observe the output in CRO .
4.note the cross over distortion in output.(outputVp-p)
5.remove the collector connection and put ammeter.
6.note the Idc value in the ammeter.
7.using Pdc and Pac formulas find the efficiency.

OBSERVATION:

Pac=Vm2/2RL =

Pdc=Vcc*Idc =

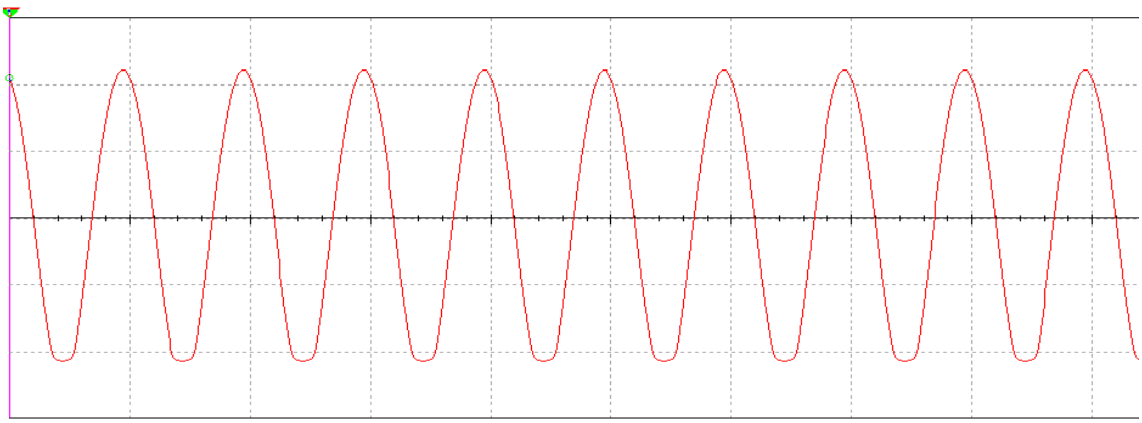
VO =

VCC =

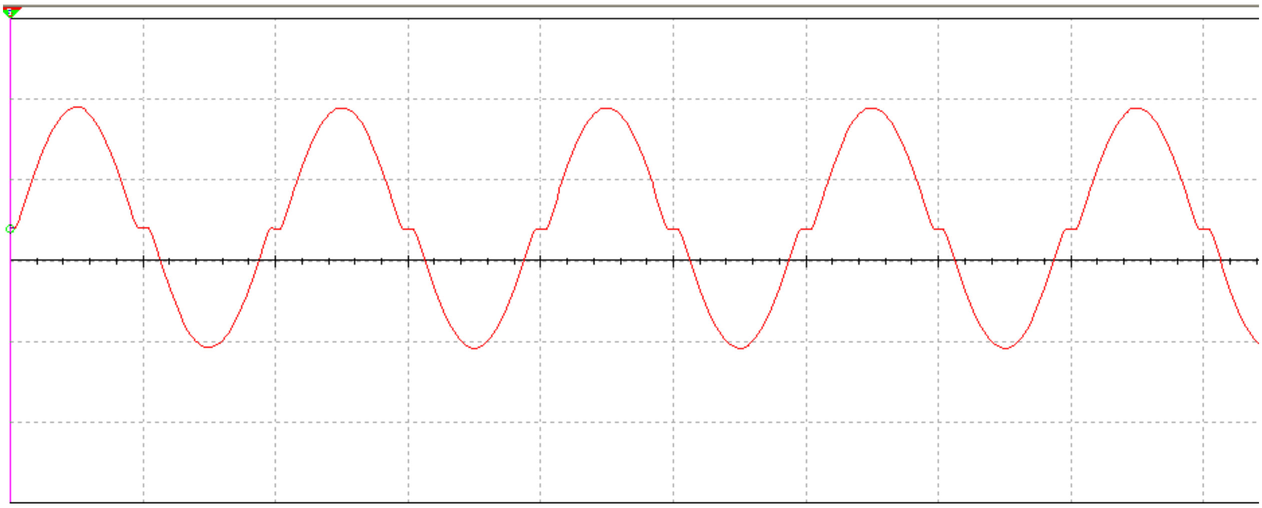
RL =

EFFICIENCY: η =Pac/Pdc*100=

MODEL GRAPHS: **I/P WAVEFORM**



O/P WAVEFORM



7. HARTLEY OSCILLATOR

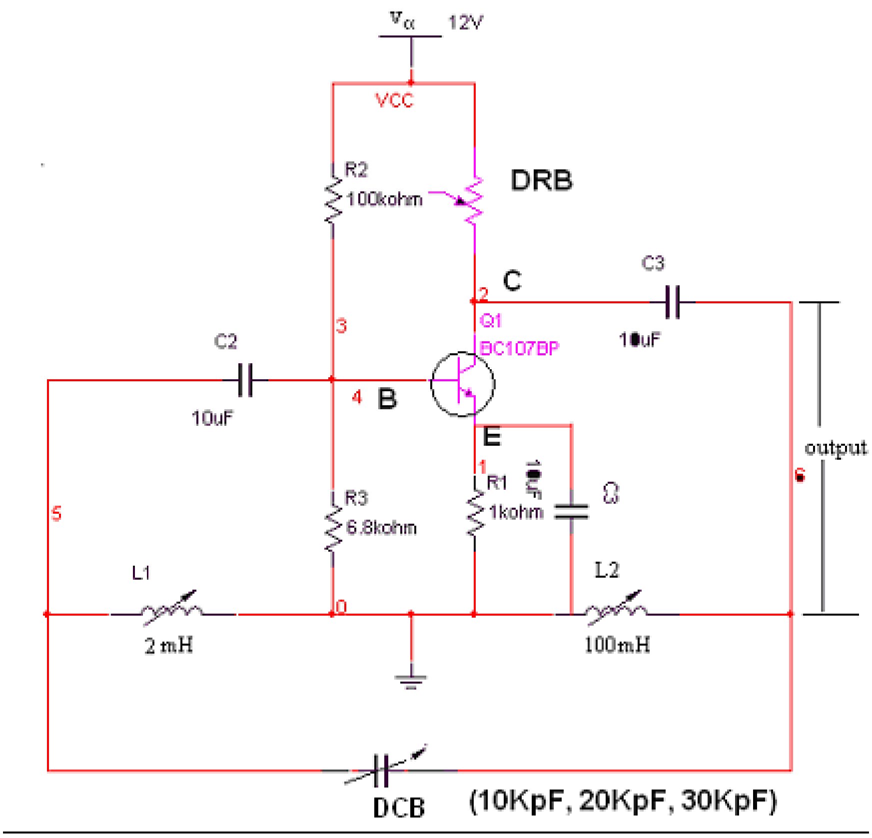
AIM: To study and calculate frequency of oscillations of Hartley oscillator. Compare the frequency of oscillations, theoretically and practically.

APPARATUS:

Hartley Trainer kit

Connecting wires

CIRCUIT DIAGRAM:



THEORY:

Hartley oscillator is very popular and is commonly used as a local oscillator in radio receivers. It has two main advantages viz... Adaptability to wide range of frequencies and easy to tune. The tank circuit is made up of L1, L2, and C1. The coil L1 is inductively coupled to coil L2, the combination functions as auto transformer. The resistances R2 and R3 provide the necessary biasing. The capacitance C2 blocks the d.c component. The frequency of oscillations is determined by the values of L1, L2 and C1 and is given by,

$$F=1/(2\pi(C1(\sqrt{L1+L2})))$$

The energy supplied to the tank circuit is of correct phase. The auto transformer provides 180° out of phase. Also another 180° is produced By the transistor. In this way, energy feedback to the tank circuit is in phase with the generated oscillations.

PROCEDURE:

1. Connections are made as per the circuit diagram.
2. Connect CRO at output terminals and observe wave form.
3. Calculate practically the frequency of oscillations by using the Expression.

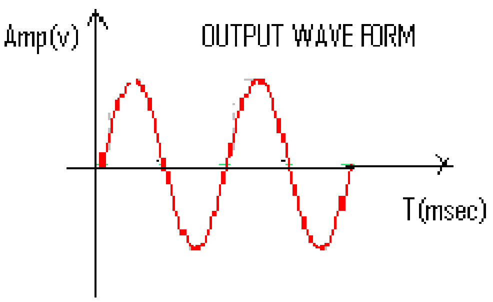
   F=1/T, Where T= Time period of the waveform

4. Repeat the above steps 2, 3 for different values of L1 and note Down practical values of oscillations of colpitts oscillator.
5. Compare the values of frequency of oscillations both theoretically And Practically.

OBSERVATIONS:

CAPACITANCE(μF), INDUCTANCE(mH)	Theoritical frequency (KHZ)	Practical frequency (KHZ)

MODEL GRAPH:



<u>RESULT</u>: Frequency of oscillations is calculated and compared with theoretical values.

F(theoretical) = $1/2\pi\Gamma LC$=

F(practicl) =

8. CLASS -A POWER AMPLIFIER(TRANSFORMER COUPLED)

AIM: To observe the input and output waveforms and to calculate the efficiency.

EQUIPMENT REQUIRED:

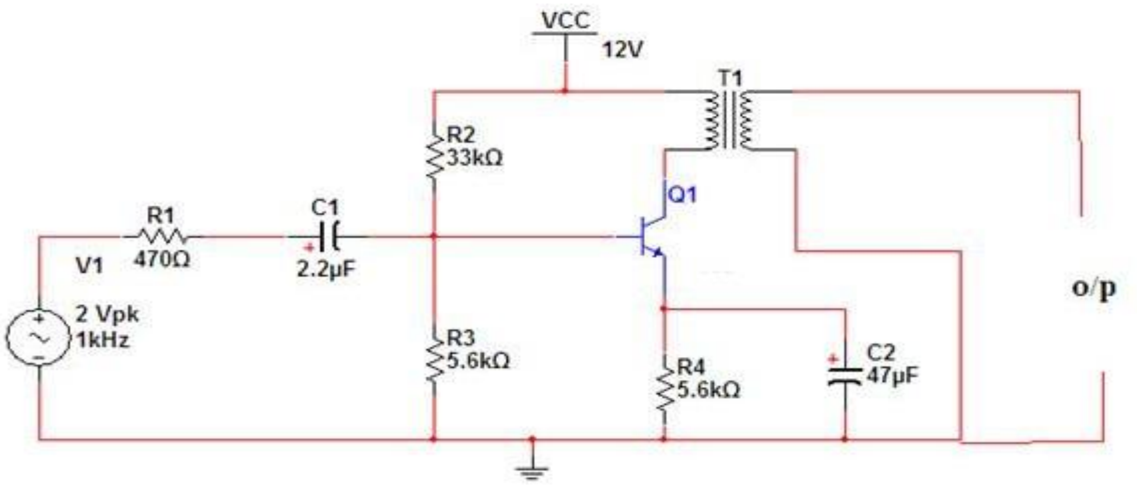
APPARATUS REQUIRED:

Power supply 0-30V- 1 No.
CRO 20MHz - 1 No.
Digital multimeter - 1 No.
Signal generator 1Hz - 1MHz - 1 No.

COMPONNTS REQUIRED:

Resistors 33KΩ - 1N0
5.6KΩ -2NO
470Ω -1NO
Capacitors 47uf -1NO
2.2uf - 1NO
TRANSFORMER -1NO

CIRCUIT DIAGRAM:



THEORY:

The amplifier is said to be class A power amplifier if the q point and the input signal are selected such that the output signal is obtained for a full input cycle . For this class the position of q point is approximately y at the mid point of the load line. For all the values of input signal the transistor remains in the active region and never entire into the cutoff or saturation region. The collector current flows for 3600 (life cycle) of the input signal in other words the angle of the collector current flow is 3600 the claa a amplifiers or furthers classified as directly coupled and transformer coupled and transformer coupled amplifiers in directly coupled type .The load is directly connected in the collector circuit while in the transformer coupled type, the load is coupled to the collector using the transformer.

Advantages:

1. Distortion analysis is very important
2. It amplifies audio frequency signals faithfully hence they are called as audio amplifiers

Disadvantages:
1. H parameter analysis is not applicable
2. Due to large power handling the transistor is used power transistor which is large in size and having large power rating

PROCEDURE:

1.CONNCECT the circuit as per the ciecuit diadram

2. Set Vs (say 250 to 300 mV), at 10 KHz using signal generator.

3. Connect milli ammeter to the ammeter terminals

4. By keeping the input voltage constant, vary the frequency from 0 to 1MHz

   in regular steps .

5. Note down the corresponding output voltage from CRO

6. Calculate the DC input power using the formula Pdc= $V_{cc}I_c$

7. Calculate the AC output power using the formula Pac = $V_O^2/8R_L$

8. Calculate the efficiency n = Pac /Pdc
9. Plot the graph between Gain (db) and frequency.

10. Calculate bandwidth from the graph.

OBSERVATIONS:

VO =________________________________, VI = ______________________________

VCC = _______________________________

RL = _______________________________

CALCULATIONS:

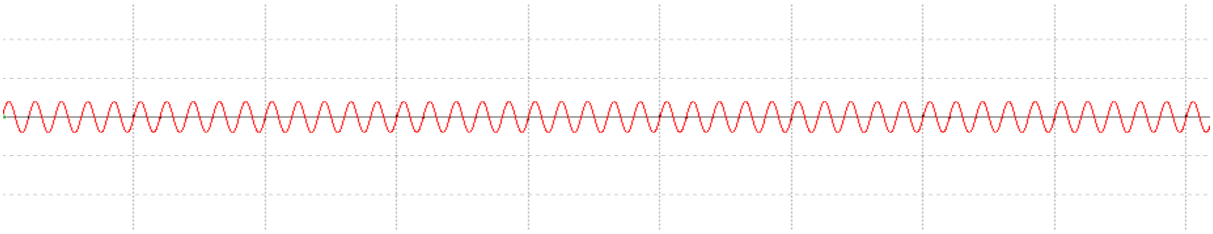
Efficiency (Pac/ Pdc) = ___________________

$P_{ac} = V_{cc}$ Ic

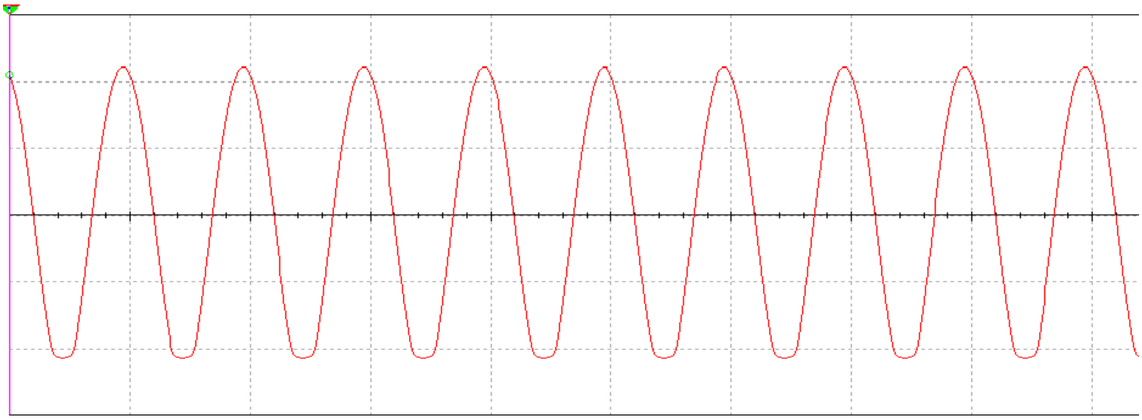
$P_{DC} = V_m/2R_L = V^2_{pp}/8R_L$

$\%n = P_{ac}/ P_{DC}$ X 100

GRAPH: I/P



O/P



RESULT: Gain and frequency as observed of Class A power amplifier.

$\%n = P_{ac} / P_{DC}$ X 100 =

9.VOLTAGE-SERIES FEEDBACK AMPLIFIER

AIM: To study the effect of voltage series feedback on Gain of the Amplifier.

APPARATUS:

Transistor BC 107 -1no

Breadboard

Regulated Power Supply(0-30V,1A)

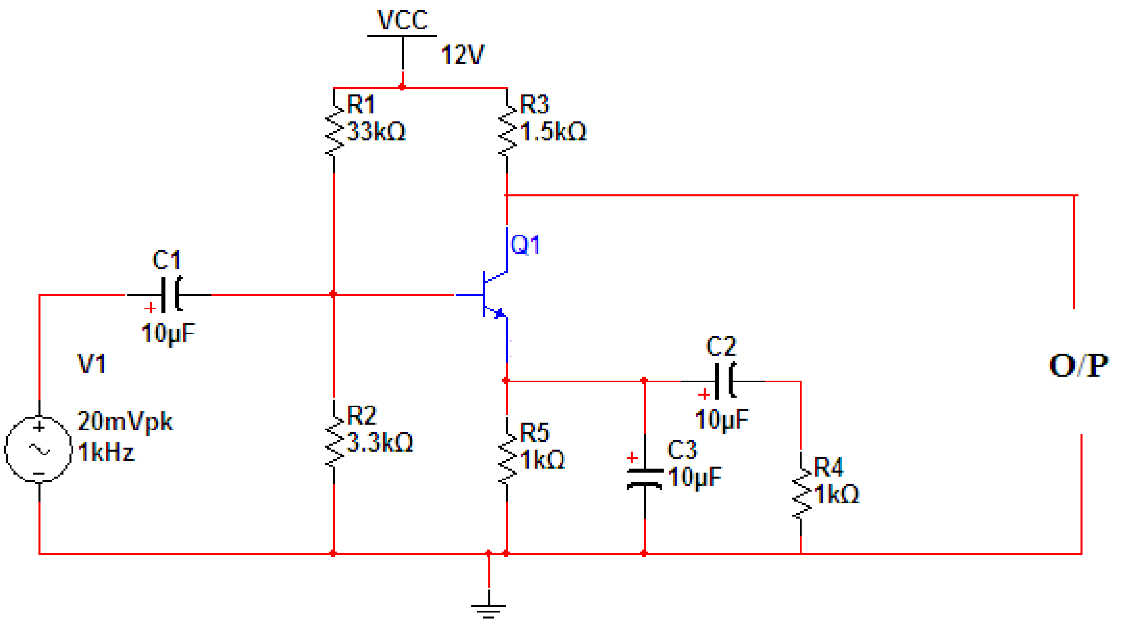
Function Generator

CRO (30 Mhz,dualtrace)

Resistors 33kΩ,3.3k Ω,1.5kΩ,1kΩ-2no

Capacitors 10µF - 3Nos

CIRCUIT DIAGRAM:



THEORY:

When any increase in the output signal results into the input in such a way as to cause the decrease in the output signal, the amplifier is said to have negative feedback. The advantages of providing negative feedback are that the transfer gain of the amplifier with feedback can be stablised against varations in the hybrid parameteresof the transistor or the parameters of the other active devices used in the circuit. The most advantage of the negative feedback is that by propere use of this , there is significant improvement in the frequency respponse and in the linearity of the operation of the amplifier.This disadvantage of the negative feedback is that the voltage gain is decreased.

In Voltage-Series feedback , the input impedance of the amplifier is decreased and the output impedance is increased.Noise and distortionsare reduced cosiderably.

PROCEDURE:

1. Connections are made as per circuit diagram.
2. Keep the input voltage constant at 20mV peak-peak and 1kHz frequency.For different values of load resistance, note down the output voltage and calculate the gain by using the expression

   $A_v = 20\log(V_0 / V_i)$ dB
3. Add the emitter bypass capacitor and repeat STEP 2.And observe the effect of Feedback on the gain of the amplifier
4. For plotting the frquency the input voltage is kept constant at 20mV peak-peak and the frequency is varied from 100Hz to 1MHz.
5. Note down the value of output voltage for each frequency. All the readings are tabulated and the voltage gain in dB is calculated by using expression $A_v = 20\log(V_0 / V_i)$ dB
6. A graph is drawn by takung frquency on X-axis and gain on Y-axis on semi log graph sheet
7. The Bandwidth of the amplifier is calculated from the graph using the expression Bandwidth B.W = $f_2 - f_1$.

Where f_1 is lower cutt off frequency of CE amplifier

f_2 is upper cutt off frequency of CE amplifier

The gain-bandwidth product of the amplifier is calculated by using the expression

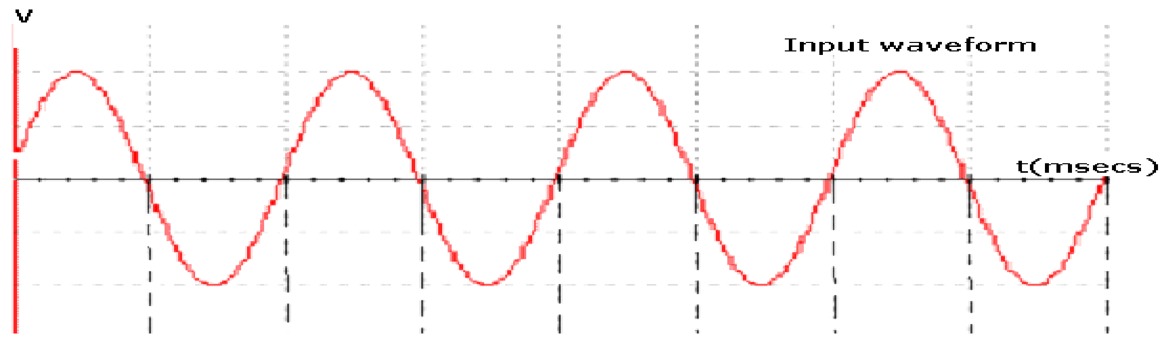
Gain-Bandwidth Product = 3-dB midband gain X Bandwidth.

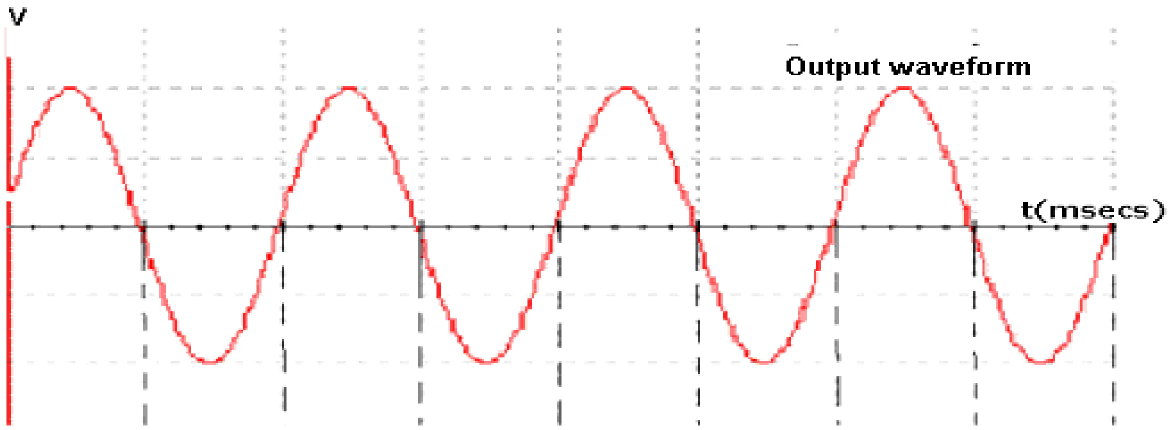
OBSERVATIONS:

Frequency Response with feedback: V_i = 20mV

S.NO	Frequency (Hz)	OutputVoltage(V_o)	Gain A = V_o/V_i	Gain in dB 20log(V_o/V_i)

MODEL WAVEFORMS:





Result:

Bandwidth(with feed back)=f2-f1

10.CLASS B PUSH PULL POWER AMPLIFIER

AIM: To observe the input and output waveforms and to calculate the efficiency of Class B Complimentary symmetry power amplifier.

EQUIPMENT REQUIRED:

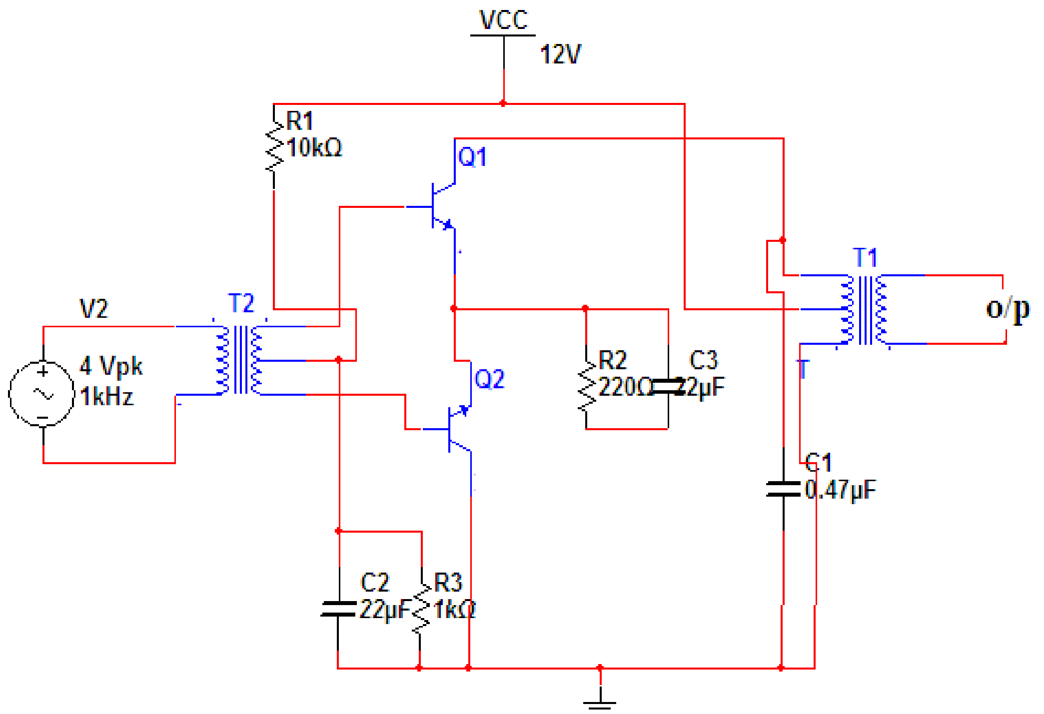
APPARATUS REQUIRED:

Power supply 0-30V- 1 No.
CRO 20MHz - 1 No.
Digital multimeter - 1 No.
Signal generator 1Hz - 1MHz - 1 No.

COMPONNTS REQUIRED:

Resistors 10KΩ - 1N0
1KΩ - 1NO
220Ω -1NO
Capacitors 0.47uf -1NO
22uf - 2NO
TRANSFORMER -2NO

CIRCUIT DIAGRAM:



THEORY:

An amplifying system consists of several stages in cascade. The input and the intermediate stages amplify small signal excitations to a value large enough to drive the final device .The out put stage feeds the final device .The output stage feeds a transducer such as a CRO,loudspeaker or servomotor. Thus the final stage must be capable of delivering a large voltage or current or appreciable amount of power. This requires an amplifier which is referred as a power amplifier

In class B complimentary symmetry class _B amplifier one n-p-n and p-n-p is used. Hence the circuit is called class-B complimentary symmetry amplifier. This circuit ifis transformer less circuit .But with common emitter configuration it becomes power transfer without output impedance for maximum power transfer without an output transformers. Hence the matched pair of complementary transistors are used in common collector configuration This is because in common collector configuration has lowest output impedance and hence the impedance matching is possible.

PROCEDURE:

1. connect the circuit s per the circuit diagram
2. apply 4v p-p with 1KHZ frequency using function generator
3. observe the output in CRO .
4. note the cross over distortion in output.(outputVp-p)
5. remove the collector connection and put ammeter.
6. note the Idc value in the ammeter.
7. using Pdc and Pac formulas find the efficiency.

OBSERVATION:

VO =

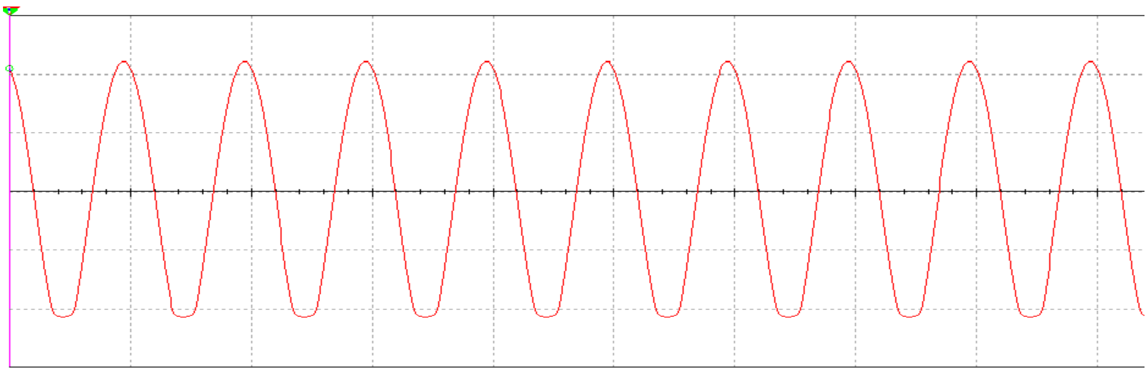
VCC =

RL =

EFFICIENCY: $P_{ac}/P_{DC} = V_{mx}$ II /4 X V_{CC} =

Vm = V pp/2

MODEL GRAPHS: **I/P**



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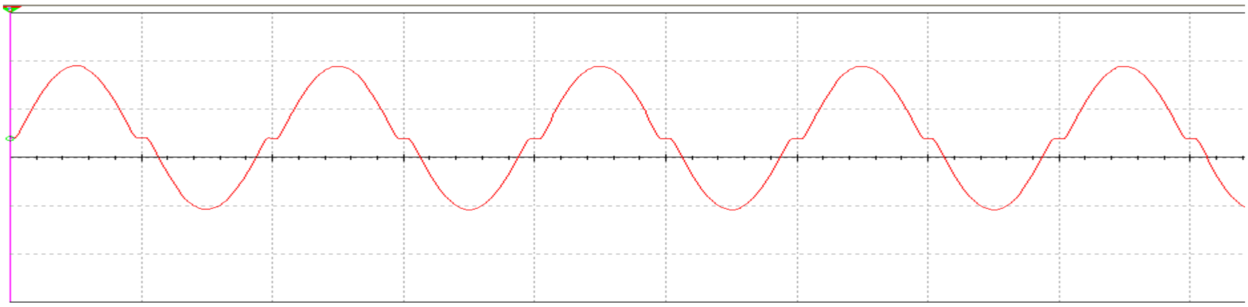

RESULT: The efficiency of class B complimentary symmetry power amplifier is obtained.

EFFICIENCY: $P_{ac}/P_{DC} = V_{mx}$ II /4 X V_{CC} =