

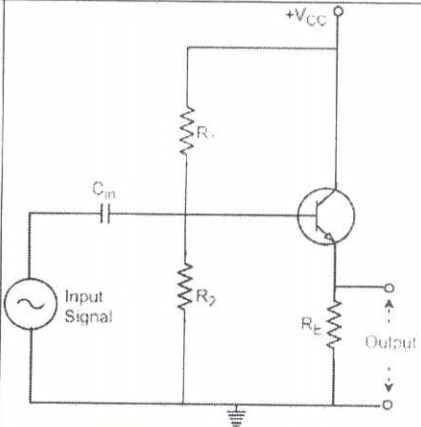
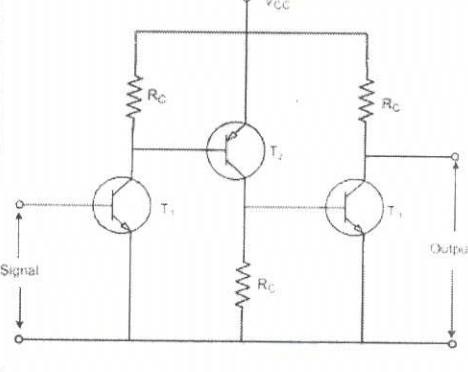
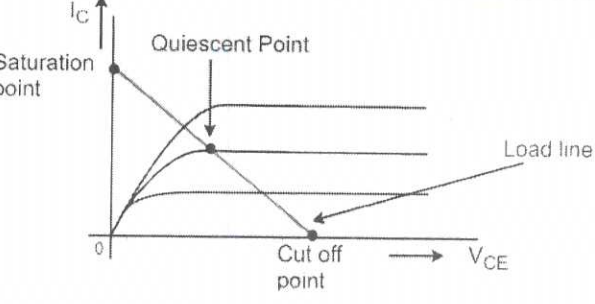
Scoring Indicators

COURSE NAME :ELECTRONIC CIRCUITS

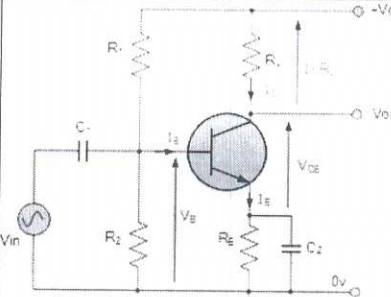
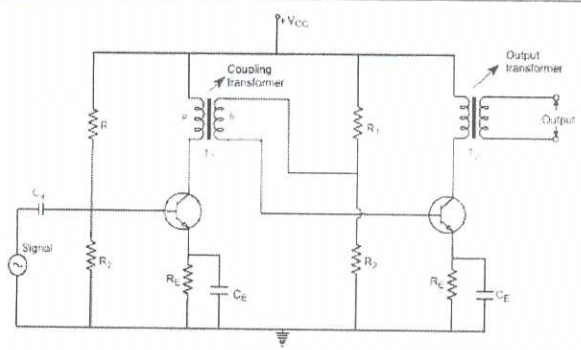
COURSE CODE :3043

QID :2110220222

Q No	Scoring Indicators	Split score	Sub Total	Total Score
PART A				9
I. 1	Active, saturation, cut off	1	1	
I. 2	180 degree	1	1	
I. 3	Resistive	1	1	
I. 4	50% 25% for resistive load	1	1	
I. 5	$A\beta = 1..$ phase shift zero	1	1	
I. 6	1. Stabilizes Amplifier Gain 2. Reduces Non-linear Distortion 3. Increases Circuit Stability 4. Increases Input Impedance/Resistance 5. Decreases Output Impedance/Resistance 6. Improves Frequency Response & Bandwidth	Any two $\frac{1}{2} * 2$	1	
I. 7	$f_r = \frac{1}{2\pi RC}$	1	1	
I. 8	Cut off	1	1	
I. 9	one	1	1	
PART B				24
II. 1	<p align="center">Fig Voltage divider bias circuit</p>	3	3	

II. 2		3	3	
II. 3		3	3	
II. 4	<p>Resonant Frequency, $F_R = 1/2\pi\sqrt{LC}$ $L=150 \times 10^{-3} \text{H}$, $C=40 \times 10^{-6} \text{F}$ $F_R=64.97 \text{Hz}$</p>	1+2	3	
II. 5	 <p>When a line is drawn joining the saturation and cut off points, such a line can be called as Load line. This line, when drawn over the output characteristic curve, makes contact at a point called as Operating point. This operating point is also called as quiescent point or simply Q-point.</p>	2+1Fig	3	
II. 6	Voltage series, Voltage shunt, Current series and Current shunt.	3	3	

<p>II. 7</p>	<ul style="list-style-type: none"> • Uses negative oscillator resistance property for the generation of the sawtooth waveform. • Relaxation oscillator. • Voltage regulator. • switching circuit. • triggering device for silicon control rectifiers (SCR). • Used as a phase control circuit 	<p>Any 3</p>	<p>3</p>	
<p>II. 8</p>	<p style="text-align: center;">Fixed bias Bistable Multivibrator</p>	<p>3</p>	<p>3</p>	
<p>II.9</p>	<ul style="list-style-type: none"> • Schmitt triggers are mainly used for changing a sine wave to square wave. • They must be utilized in the switch de-bouncer circuit for a noisy otherwise slow input requirements like to be cleaned up or speed up • These are normally utilized in applications like signal conditioning for removing signals noise in digital circuits. • These are used to implement relaxation oscillators for closed loop negative response designs • These are used in switching power supplies as well as function generators 	<p>Any 3</p>	<p>3</p>	

II.10	<ul style="list-style-type: none"> ➤ The astable multivibrator is used as the wave generator. ➤ It is used as voltage-frequency converter. ➤ It is used in pulse synchronization. ➤ Since it produces square waves, it is a source of production of a harmonic frequency of higher order. ➤ It is used in the construction of voltmeter and SMPS. ➤ I can be operated as an oscillator over a wide range of audio and radio frequencies. 	Any 3 3 x 1	3	
PART C				
III. 1	 $\beta = \frac{\Delta I_C}{\Delta I_B}$ $\text{Voltage Gain} = \frac{V_{out}}{V_{in}} = \frac{\Delta V_{L}}{\Delta V_{E}} = -\frac{R_L}{R_E}$	4+3 equations	7	42 7
III. 2	 <p>When an AC signal is applied to the input of the base of the first transistor then it gets amplified by the transistor and appears at the collector to which the primary of the transformer is connected.</p> <p>The transformer which is used as a coupling device in this circuit has the property of impedance changing, which means</p>	4+3Exp	7	7

	<p>the low resistance of a stage (or load) can be reflected as a high load resistance to the previous stage. Hence the voltage at the primary is transferred according to the turns ratio of the secondary winding of the transformer.</p> <p>This transformer coupling provides good impedance matching between the stages of amplifier..</p>					
III. 3	<p style="text-align: center;">Difference between voltage and power amplifier.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Voltage amplifier</p> <ul style="list-style-type: none"> • Voltage amplifier is used to raise voltage level of weak signal. • No need of heat sink in voltage amplifier. • Distortion in output will be minimum. • Size of transistor used is small. • RC coupling is widely used. • Used as first stage of amplifier. • Output impedance is high. </td> <td style="width: 50%; vertical-align: top;"> <p>Power amplifier</p> <ul style="list-style-type: none"> • Power amplifier is used to raise power level of weak signal. • Heat sink are used in power amplifier. • Distortion in output will be minimum. • Size of power transistor is large. • Transformer coupling is widely used. • Used as last stage of amplifier. • Output impedance is low. </td> </tr> </table>	<p>Voltage amplifier</p> <ul style="list-style-type: none"> • Voltage amplifier is used to raise voltage level of weak signal. • No need of heat sink in voltage amplifier. • Distortion in output will be minimum. • Size of transistor used is small. • RC coupling is widely used. • Used as first stage of amplifier. • Output impedance is high. 	<p>Power amplifier</p> <ul style="list-style-type: none"> • Power amplifier is used to raise power level of weak signal. • Heat sink are used in power amplifier. • Distortion in output will be minimum. • Size of power transistor is large. • Transformer coupling is widely used. • Used as last stage of amplifier. • Output impedance is low. 	7	7	7
<p>Voltage amplifier</p> <ul style="list-style-type: none"> • Voltage amplifier is used to raise voltage level of weak signal. • No need of heat sink in voltage amplifier. • Distortion in output will be minimum. • Size of transistor used is small. • RC coupling is widely used. • Used as first stage of amplifier. • Output impedance is high. 	<p>Power amplifier</p> <ul style="list-style-type: none"> • Power amplifier is used to raise power level of weak signal. • Heat sink are used in power amplifier. • Distortion in output will be minimum. • Size of power transistor is large. • Transformer coupling is widely used. • Used as last stage of amplifier. • Output impedance is low. 					
III. 4	<p>Here, $L=2H, C=32\mu F=32 \times 10^{-6}F, R=10\Omega$</p> <p>$\therefore$ Resonance frequency,</p> $\omega_r = 1/\sqrt{LC}$ <p>Quality factor = $\omega_r L/R = 25$</p>	2+2+3	7	7		
III. 5		4+3Exp	7	7		

Then the Class AB amplifier output stage combines the advantages of the Class A amplifier and the Class B amplifier while minimising the problems of low efficiency and distortion associated with them.

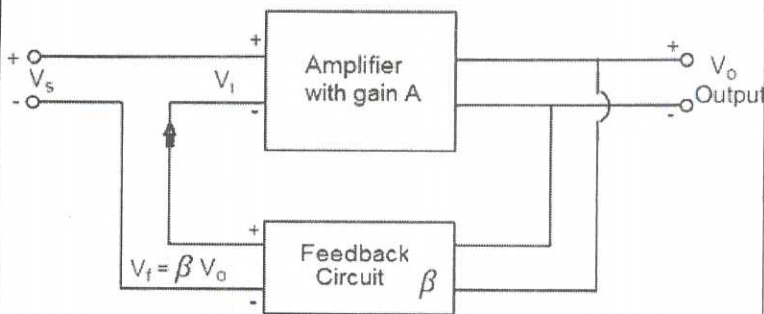
This action is achieved by pre-biasing the two transistors in the amplifiers output stage.

Thus each transistor will conduct between 180° and 360° of the time depending on the amount of current output and pre-biasing. Thus the amplifier output stage operates as a Class AB amplifier.

III. 6

Class	A	B	C	AB
Conduction Angle	360°	180°	Less than 90°	180 to 360°
Position of the Q-point	Centre Point of the Load Line	Exactly on the X-axis	Below the X-axis	In between the X-axis and the Centre Load Line
Overall Efficiency	Poor 25 to 30%	Better 70 to 80%	Higher than 80%	Better than A but less than B 50 to 70%
Signal Distortion	None if Correctly Biased	At the X-axis Crossover Point	Large Amounts	Small Amounts

III. 7



A feedback amplifier generally consists of two parts. They are

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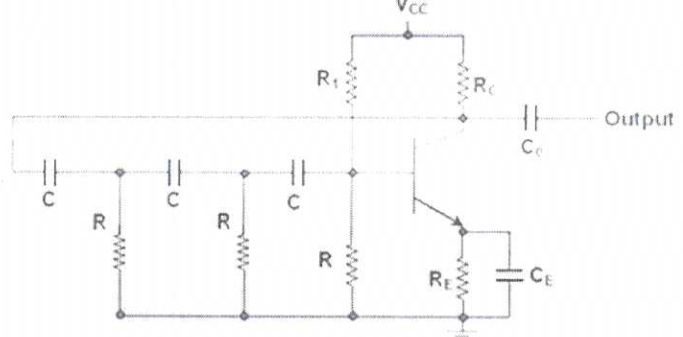
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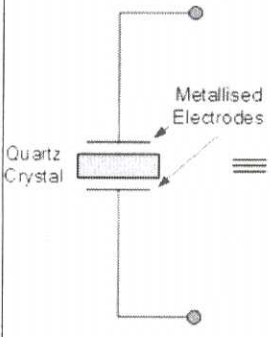
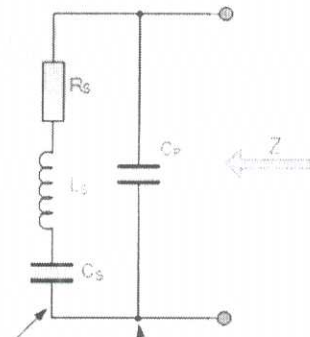
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3+4Exp

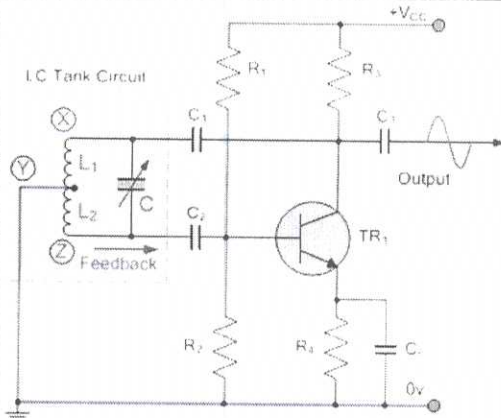
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	<p>the amplifier and the feedback circuit. the gain of the amplifier is represented as A. the gain of the amplifier is the ratio of output voltage V_o to the input voltage V_i. the feedback network extracts a voltage $V_f = \beta V_o$ from the output V_o of the amplifier.</p> <p>The equation of gain of the feedback amplifier, with negative feedback is given by</p> $A_f = \frac{A}{1 + A\beta}$ <p>The equation of gain of the feedback amplifier, with positive feedback is given by</p> $A_f = \frac{A}{1 - A\beta}$			
<p>III. 8</p>	 <p style="text-align: center;">Figure 2 RC Phase-Shift Oscillator Using BJT</p> <p>The circuit when switched ON oscillates at the resonant frequency f_o. The output of the amplifier is fed back to RC feedback network. This network produces a phase shift of 180° and a voltage E_i appears at its output. This voltage is applied to the transistor amplifier. The feedback is in correct phase, whereas the transistor amplifier, which is in CE configuration, produces a 180° phase shift. The phase shift produced by network and the transistor add to form a phase shift around the entire loop which is 360°.</p> $f_{\text{oscillation}} = \frac{1}{2\pi RC\sqrt{6}}$	<p>4+3Exp</p>	<p>7</p>	<p>7</p>

<p>III. 9</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Actual Crystal</p>  <p>Quartz Crystal</p> <p>Metallised Electrodes</p> </div> <div style="text-align: center;"> <p>Equivalent Circuit Model</p>  <p>Rs</p> <p>Ls</p> <p>Cs</p> <p>Cp</p> <p>Z</p> <p>Represents Inertia, Friction and Stiffness of Crystal</p> <p>Represents Parallel Capacitance of Plates</p> </div> </div> <p>The equivalent electrical circuit for the quartz crystal shows a series RLC circuit, which represents the mechanical vibrations of the crystal, in parallel with a capacitance, Cp which represents the electrical connections to the crystal. Quartz crystal oscillators tend to operate towards their “series resonance”.</p> <p>The equivalent impedance of the crystal has a series resonance where Cs resonates with inductance, Ls at the crystals operating frequency. This frequency is called the crystals series frequency, fs.</p> $f_s = \frac{1}{2\pi\sqrt{L_s C_s}}$ <p>As well as this series frequency, there is a second frequency point established as a result of the parallel resonance created when Ls and Cs resonates with the parallel capacitor Cp</p> $f_p = \frac{1}{2\pi\sqrt{L_s \frac{C_p C_s}{C_p + C_s}}}$	<p>3+4Exp</p>	<p>7</p>	<p>7</p>
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III. 10



4+3Exp

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When the collector supply is given, a transient current is produced in the oscillatory or tank circuit. The oscillatory current in the tank circuit produces a.c. voltage across L1.

As the CE configured transistor provides 180° phase shift, another 180° phase shift is provided by the auto-transformer made by the inductive coupling of L1 and L2, which makes 360° phase shift between the input and output voltages.

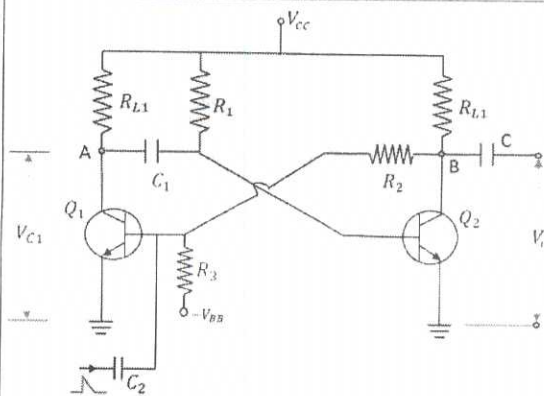
This makes the feedback positive which is essential for the condition of oscillations. When the loop gain $|\beta A|$ of the amplifier is greater than one, oscillations are sustained in the circuit.

The equation for frequency of Hartley oscillator is given as

$$f = \frac{1}{2\pi\sqrt{L_T C}}$$

$$L_T = L_1 + L_2 + 2M$$

III. 11

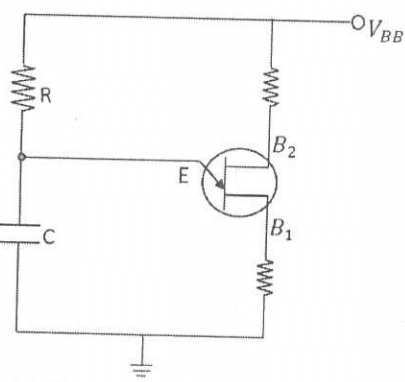


4+3Exp

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when the circuit is switched ON, transistor Q1 will be in OFF state and Q2 will be in ON state. This is the stable state. As Q1 is OFF, the collector voltage will be VCC at point A and hence

	<p>C1 gets charged. A positive trigger pulse applied at the base of the transistor Q1 turns the transistor ON. This decreases the collector voltage, which turns OFF the transistor Q2. The capacitor C1 starts discharging at this point of time. As the positive voltage from the collector of transistor Q2 gets applied to transistor Q1, it remains in ON state. This is the quasi-stable state or Meta-stable state.</p> <p>The transistor Q2 remains in OFF state, until the capacitor C1 discharges completely. After this, the transistor Q2 turns ON with the voltage applied through the capacitor discharge. This turn ON the transistor Q1, which is the previous stable state.</p>			
III. 12	 <p>Initially, the voltage across the capacitor is zero. $V_c=0$</p> <p>The UJT is in OFF condition. The resistor R provides a path for the capacitor C to charge through the voltage applied.</p> <p>The capacitor charges according to the voltage $V=V_0(1-e^{-t/RC})$</p> <p>The capacitor usually starts charging and continues to charge until the maximum voltage V_{BB}. But in this circuit, when the voltage across capacitor reaches a value, which enables the UJT to turn ON (the peak voltage) then the capacitor stops to charge and starts discharging through UJT. Now, this discharging continues until the minimum voltage which turns the UJT OFF (the valley voltage). This process continues.</p>	3+4Exp	7	7

Agar...

Dinyar
hr is sletrom