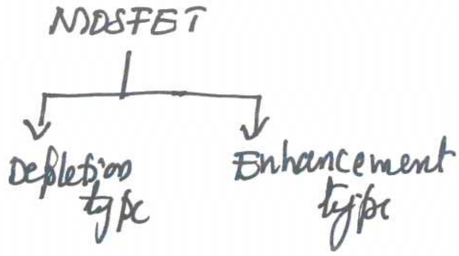
SCHEME OF VALUATION

Rev: 2015	Sub: ELECTRONIC DEVICES & CIRCUITS	Sub code: 3044 (15)		
Qst no:	Scoring Indicators	split up score	subtotal	Total
	PART – A.			
1.	For proper operation of a transistor we set a fixed level of certain currents and voltages in a transistor. These values of current and voltages define the point at which the transistor operates. This point is called operating point.	2		2.
2.	$BW = \frac{f_r}{Q}$, f_r = resonant frequency, Q = Quality factor, BW = Band width.	2		2.
3		2	1 + 1	2
4	$R_C \geq 16\,T$	2		2
5.	when a.c voltage is applied across quartz crystal, it vibrates at the frequency of the applied voltage. or. If a mechanical force is applied to vibrate a quartz crystal, it generates an a.c voltage	2		2.

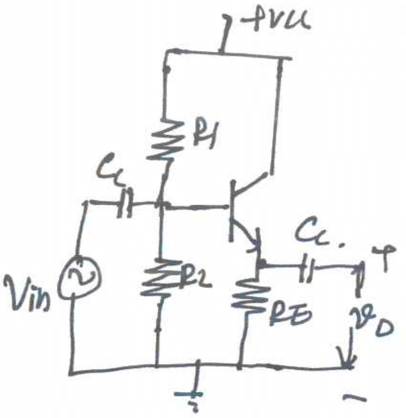
II

PART – B

1. (i) Establish the operating point in the centre of the active region of the characteristics
(ii) Stabilize the collector current against temperature variations
(iii) Make the operating point independent of the transistor parameters. So that it does not shift when transistor is replaced by another of the same type in the circuit

2 + 2 + 2 — 6

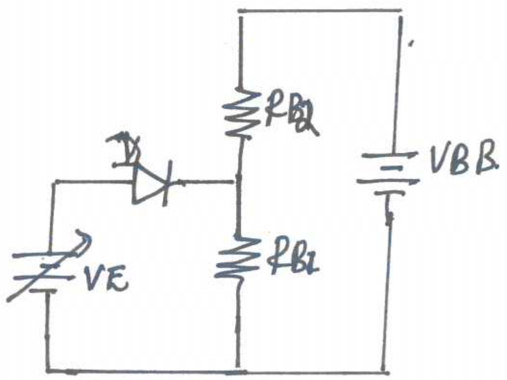
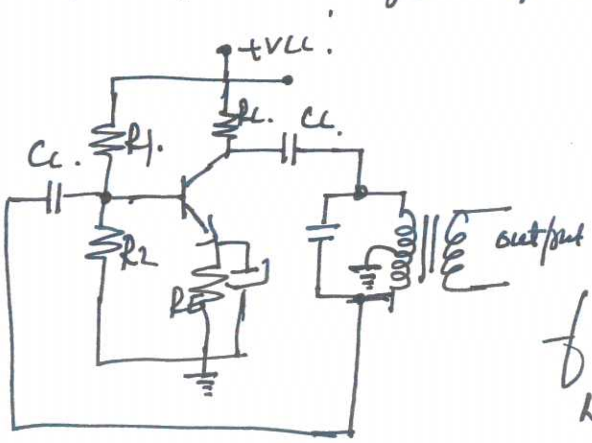
2.



circuit 3 — explain 3 — 6

An emitter follower is a very useful negative feeback circuit. The effective input Voltage in this circuit is $(v_{in} - v_o)$. It means that the whole of the output voltage 'v_o' is fed back to the input side. The output impedence is very low, input impedence is of the circuit is very high. It is used for impedence matching. output voltage across the emitter closely follows the input.

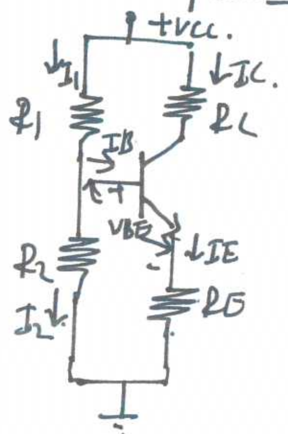
3.	The primary function of the voltage amplifier is to raise the voltage level of the signal. It is designed to achieve the largest possible voltage gain. only very little power can be drawn from its output To obtain large power at the output of the power amplifier, its input signal voltage must be large power amplifiers are called large signal amplifier. A power amplifier actually does is that it takes power from the dc power supply connected to the output circuit and converts it into useful a.c signal power	3	3	6
4.	For transistor handling small signals, the power dissipated at the collector is small. Such transistors have little chance of thermal run away. But in power transistors, the power dissipated at the collector junction is larger. This may cause the junction temperature to rise to dangerous level. We can increase the power handling capacity of a transistor if we make a suitable provision for rapid conduction of heat away from the junction. This is achived by using a sheet of metal called heatsink. Connecting a heat sink to a transistor increases the area from which heat is to be transfered to the atmosphere. Heat moves from transistor to the heat sink by conduction	6		6

5. (1) It improves the stability of amplifier gain (2) It reduces the distortion and noise (3) it increases the input impedence (4) it decreases the output impedence (5) it increases the band width	1·5 x 4		6
6.  if the applied emitter voltage is below the total reverse bias voltage across the diode the diode remains reverse biased. And there is no emitter current. when the applied emitter voltage exceeds the value equal to (ηVBB+VD) the diode conducts and the emitter current flows. The value of emitter voltage, which causes the diode to conduct is called peak point voltage - $V_P = \eta V_{BB} + V_D$.	circuit 3	explain 3	6
7.  $f = \frac{1}{2\pi\sqrt{LC}}$ $L = L_1 + L_2$	circuit 4	eq: 2.	6

III

(a)

Part - C.



The base current IB is very small compared to the currents in R_1 and R_2. That is

$$I_1 \simeq I_2 \gg I_B$$

The voltage across resistor $R_2 = \frac{V_{CC}}{R_1+R_2} \times R_2$

The voltage across the emitter resistor RE equals the voltage across R_2 minus the base to emitter voltage VBE

$$V_E = V_{R2} - V_{BE}$$

The current in the emitter $I_E = \frac{V_E}{R_E} =$

$$I_E = \frac{V_{R2} - V_{BE}}{R_E}$$

The collector to emitter voltage

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

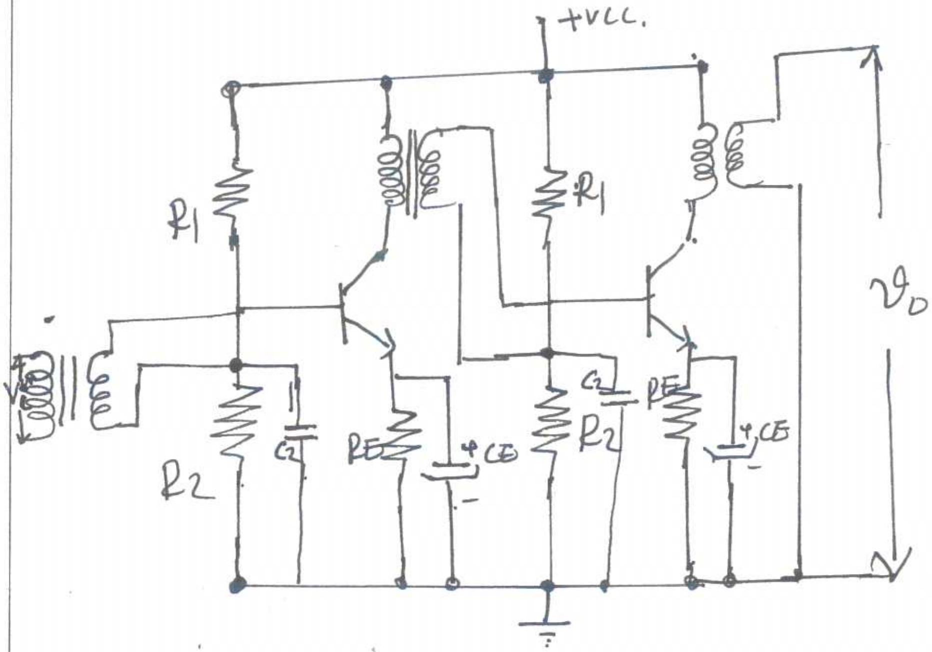
$$V_{CE} \simeq V_{CC} - (R_C + R_E) I_C$$

IC and IE are approximately equal.

circuit	equations	
3	4	7

b^{+1}_{c}

III (b)

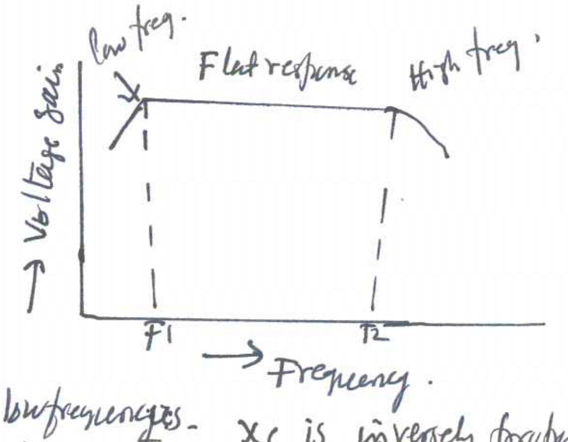


	circuit	explanation	
	4	4	8

In this circuit, there is no coupling capacitor. The d-c isolation between the two stages is provided by the transformer itself. There exist no d-c path b/w the primary and secondary winding. The main advantage is that all the d-c voltage supplied by VCC is available at the collector.

Disadvantage :- increased size.
It is not used for amplifying low freq. signal.

IV (a)



X_L : capacitive reactance.

	Fig	explanation	
	3	5	8

At low frequencies - X_C is inversely proportional to frequency. It will allow only small part of the signal to next stage.
At high frequencies :- loading effect of next stage increases. which reduces the gain
At Mid frequencies : gain is constant

IV (b)

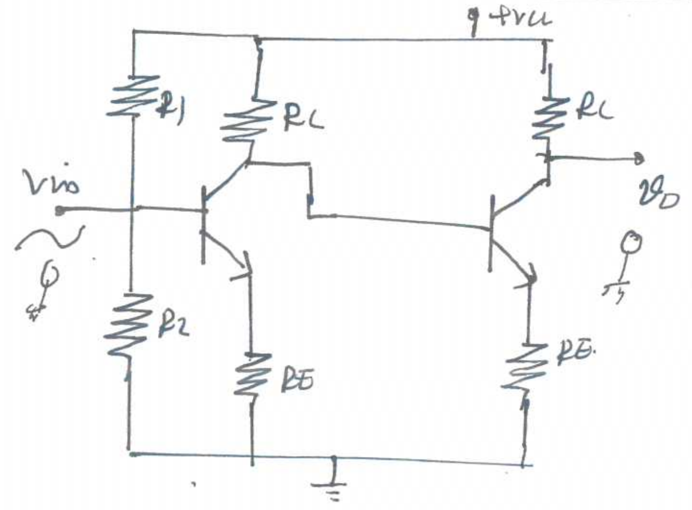
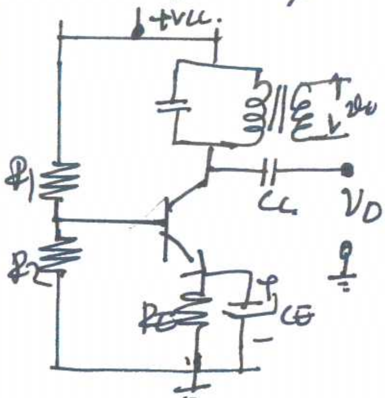


Fig 3 | explanation 4. | 7

It is called DC amplifier. The capacitor, inductors and transformers can not be used as coupling n/w at very low frequencies. The output of first stage is directly connected to the base of the next stage. There is no input or output coupling capacitors.

The signal to be amplified is applied directly to the input of first stage. Due to transistor action, it appears amplified form at the collector resistor of transistor Q1. This voltage drives the base of 2nd transistor and amplified o/p obtained across the collector resistor of Q2.

V(a)



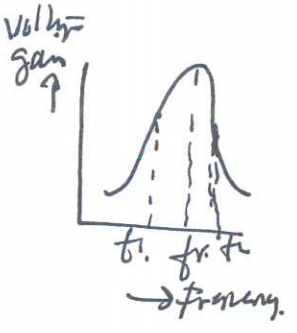


Fig 3.5 | explanation 3.5 | 7

Output is taken with the help of capacitive coupling or inductive coupling.

Advantages:- very high input impedance, and reduced inter electrode capacitance. The voltage gain is high at resonant frequencies.

V (b)

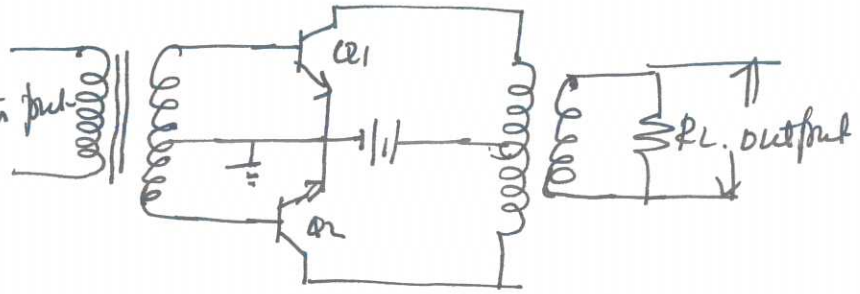


Fig 4 | explan 4. | 8

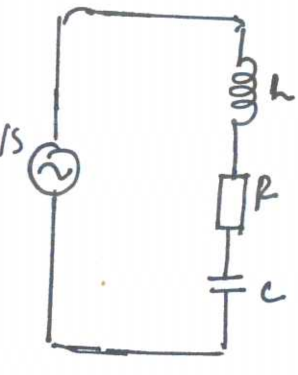
The transistor Q1 and Q2 are biased at cut off., which is done by providing zero bias on the base of each transistor.

when there is no input signal, both transistors are cut off.

During positive half cycle of input signal Q1 is on., Q2 is cut off.

During -ve half cycle of input signal Q2 is ON, Q1 is cut off.

VI (a).. Series Resonant circuit (b) Parellel resonant circuit



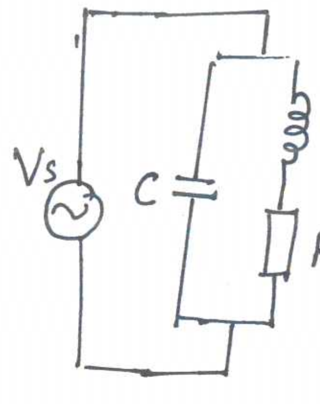


Fig 1½ + 1½ | explanation 2 + 2. | 7

Series Resonant circuit: $X_L = 2\pi f L$, $X_C = \frac{1}{2\pi f C}$

At resonance $X_L = X_C$

$2\pi f_r L = \frac{1}{2\pi f_r C}$

$f_r = \frac{1}{2\pi\sqrt{LC}}$.

Parellel resonant circuit

At resonance

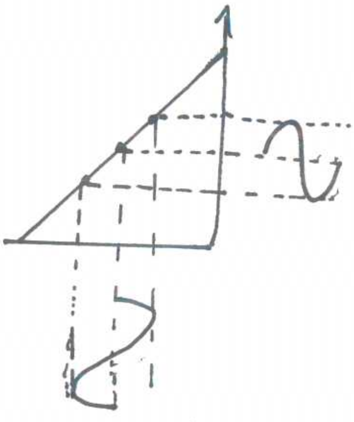
$X_L = X_C$, $I_L = I_C$

$f_r = \frac{1}{2\pi\sqrt{LC}}$

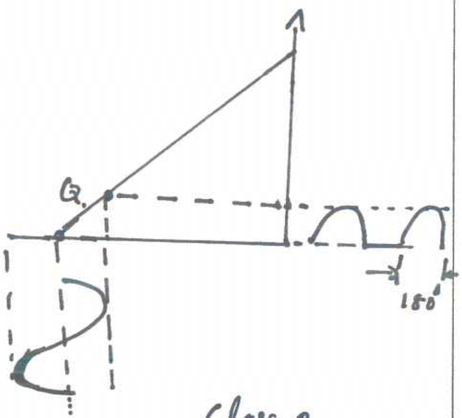
If $X_C < X_L$, then $I_C > I_L$, circuit is capacitive

$X_L < X_C$, then $I_L > I_C$, circuit is inductive.

VI (b) class A, class B, class AB, class C.

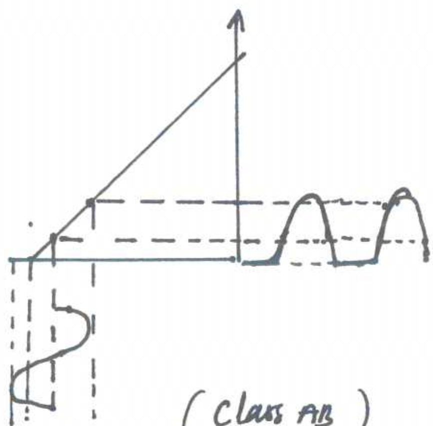


Class - A

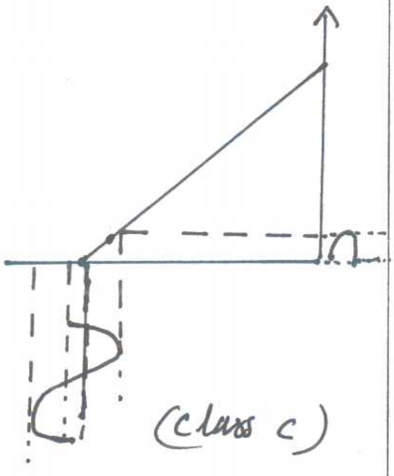


Class B

2×4 — 8



(Class AB)



(Class C)

VII(a)

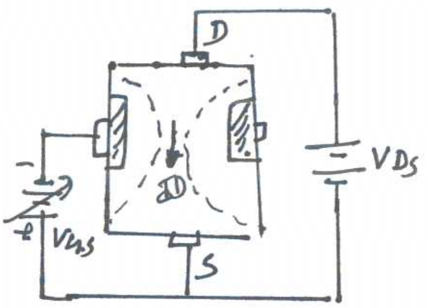
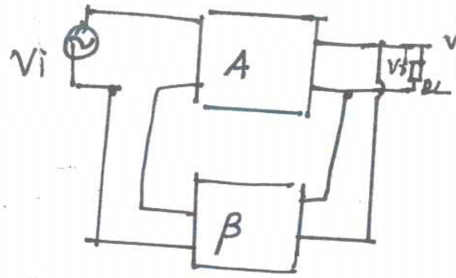


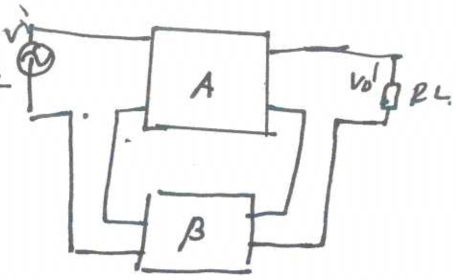
Fig 3 — working 4. — 7

When gate to source Voltage (V_{GS}) is increased above zero, the reverse bias voltage across the junction is increased. As a result, the depletion regions are widened. This reduces the effective width of the channel. therefore controls the flow of drain current through the Channel. . when V_{GS} is increased further, the two depletion region touch each other. So drain current is reduced to zero.

VII (b) Series voltage feed back.
Series current feed back.
Shunt voltage feedback
Shunt current feedback.

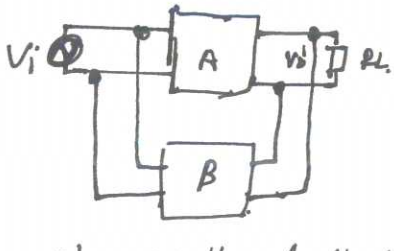


Series voltage feedback

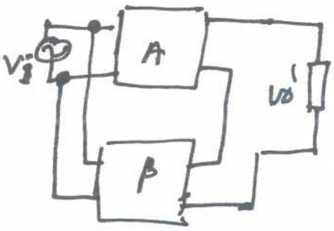


Series current feedback

2 for each fig. | 2x4 | 8

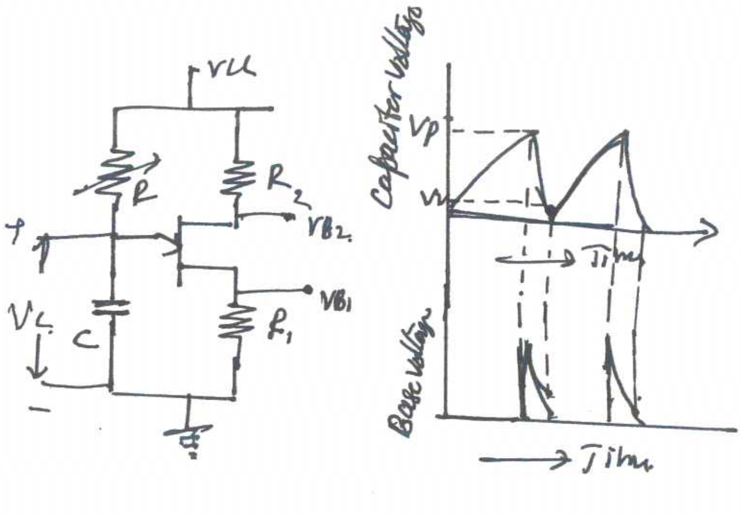


Shunt voltage feedback.



Shunt current feedback.

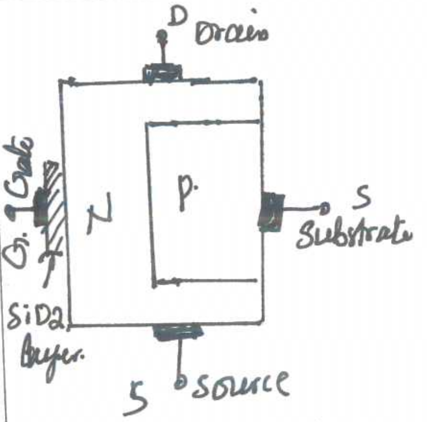
VIII (a)



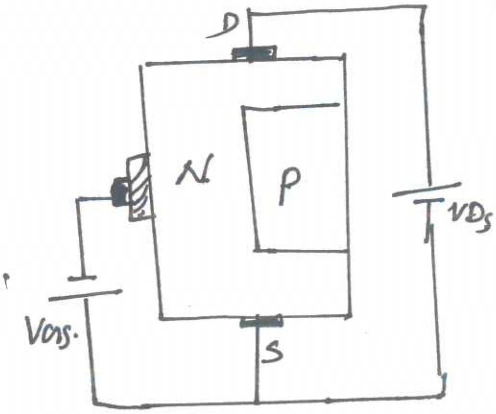
circuit 3 | explan & waveform = 4 | 7.

$$T = 2.3\,RC \log_{10} \frac{1}{1-\eta}$$

VIII(b)



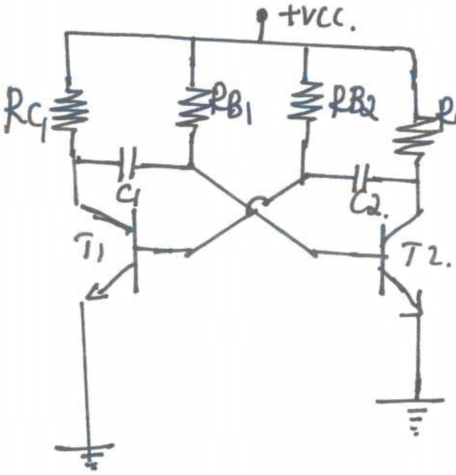
(Construction)

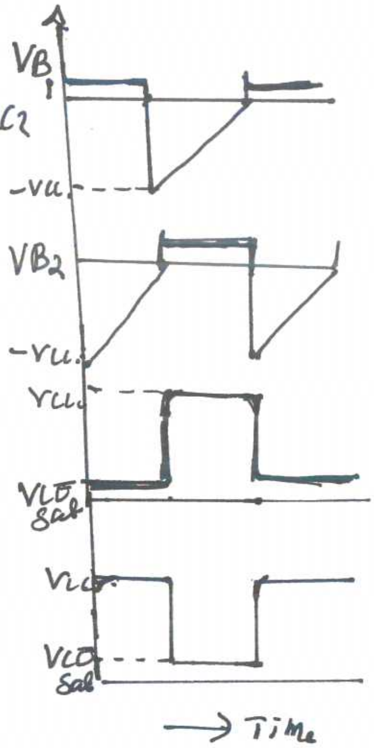


If VGS is increased the value of drain current decreases.

Structure Fig + Explanation 4 | working Fig + Explanation 4. | 8.

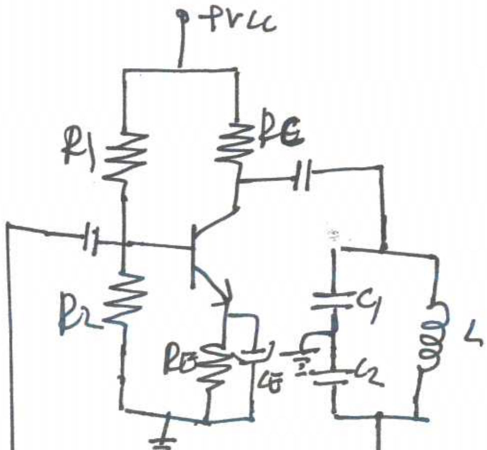
IX(a)





Circuit + explanation. 3 + 3 | Wave form 3 | 9

IX(b)



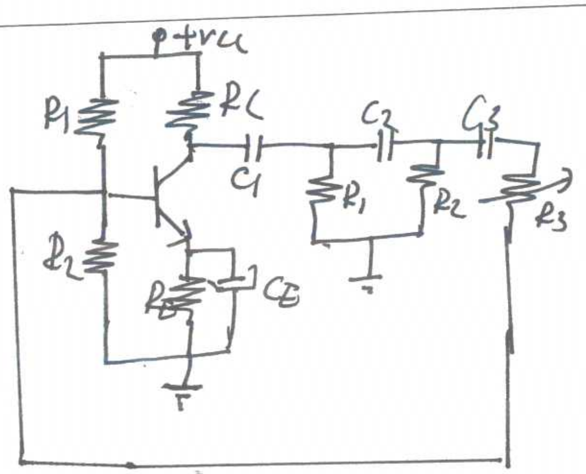
$$f = \frac{1}{2\pi\sqrt{LC}}$$

$$C = \frac{C_1 C_2}{C_1 + C_2}$$

$$f = \frac{1}{2\pi\sqrt{L \times \frac{C_1 \cdot C_2}{C_1 + C_2}}}$$

Circuit 3 | explanation 3 | 6

X(a)



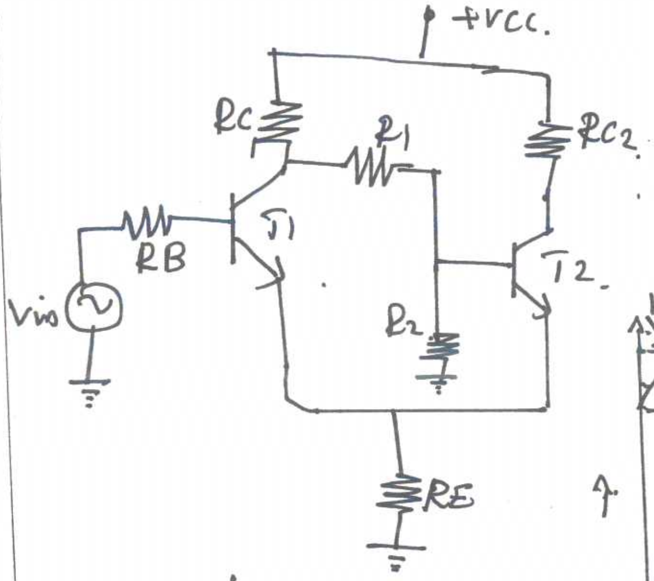
$$f = \frac{1}{2\pi RC\sqrt{6}}$$

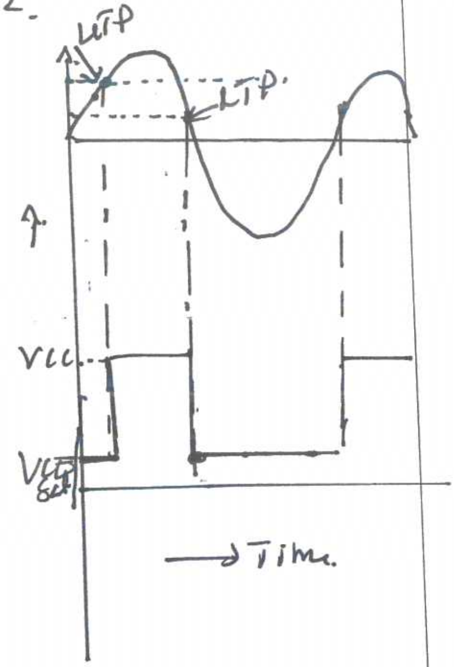
$C_1 = C_2 = C_3 = C$

$R_1 = R_2 = R_3 = R$

Circuit + equation + explanation 3+3 | 1. | 7

X(b)





Circuit + waveform + explanation 3+3 | 2. | 8.

UTP - upper Trigger point

LTP - Lower Trigger point