<UNIT- IV>

Date - 11/11/20

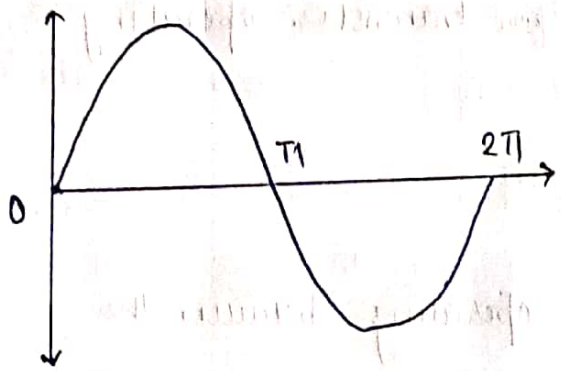
Amplifier:- An amplifier is an electronic device that increase voltage, current or power of a signal.

According to the class of operation, the amplifiers can be classified as:

- Class A ; Class B; Class AB; Class C.

(i) CLASS A :

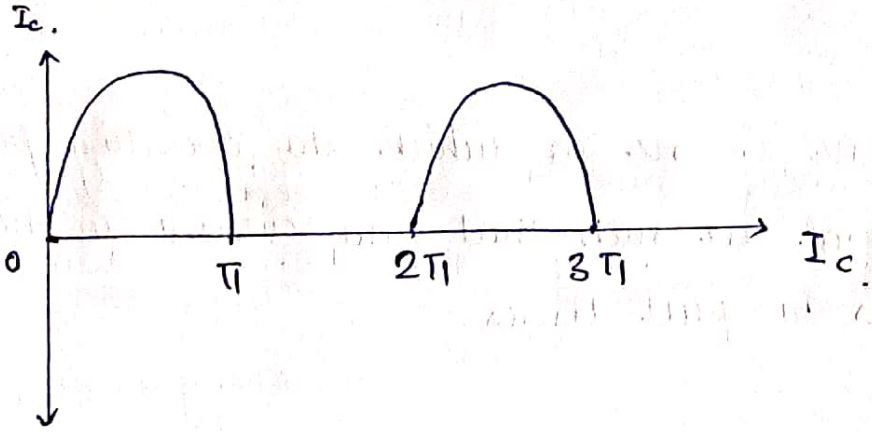
A class A amplifier is one in which the operating point and the input signal are such that the current in the output circuit flows at full times.



Collector current waveform for transistor operating in class A.

• CLASS - B :-

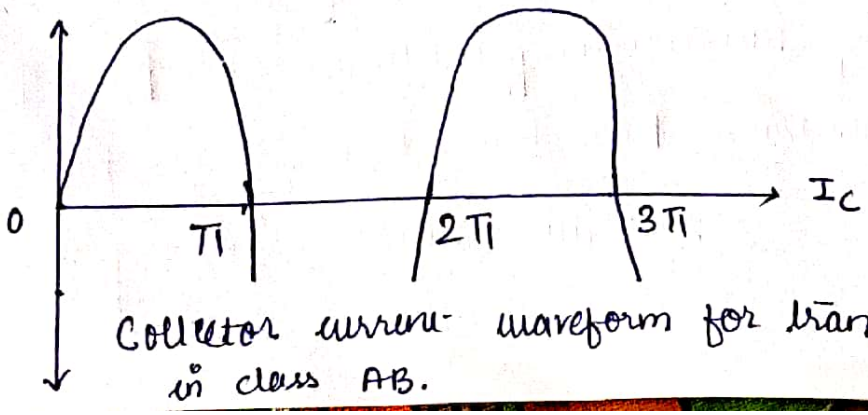
A class B amplifier is one in which the operating point is at an extreme end of its characteristic, so that the quiescent power is very small. If the signal voltage is sinusoidal amplification takes place for only one half a cycle.



Collector current waveform for transistor operating in class B.

CLASS A-B :-

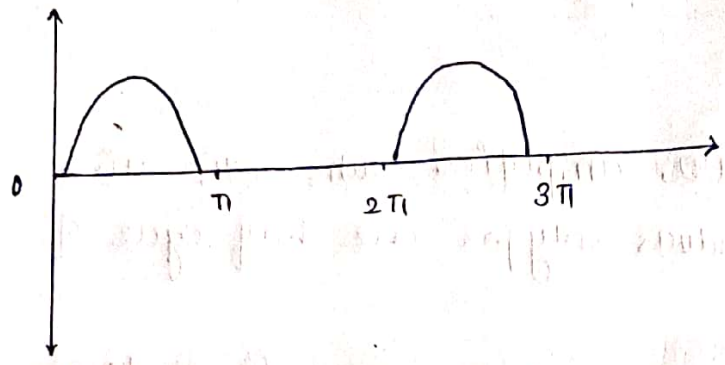
A class AB amplifier is one operating between the two extremes defined for class A and class B. Hence the output signal is zero for part but less than one half of an ~~out~~ input sinusoidal signal.



Collector current waveform for transistor operating in class AB.

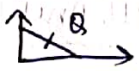
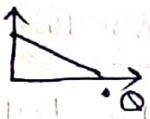
• CLASS C :-

A class C amplifier is one in which the operating point is chosen so that the output current (or voltage) is zero for more than one-half of the input sinusoidal signal cycle.



Collector current waveform for transistor operating in class C.

*** Summary :-**

Parameter	class A	class B	class AB	class C.
i) Angle of conduction	360°	180°	more than 180° But less than 360°	Less than 180°
ii) Efficiency	25% - 50%	78.5%	78.5%	95%
iii) Q-point	Exactly at the center of load line 	on x axis 	just above x-axis 	Below x-axis 
(iv) Distortion	No distortion	Distortion more than A and AB less than C	Less distortion than B, C but more than A	More distortion
(v) Application	Outdoor musical system	Audio amplifier	RF amplifier	Audio power amplifier.

16/11/20

Push Pull Amplifier:-

* Class B Push-Pull Amplifier:-

Class B amplifier:-

It is a type of power amplifier where the active device (transistor) conducts only for one half cycle of input signal.
As it is switch off for rest half cycle so it does not conduct for rest half cycle.

Push Pull Amplifier:-

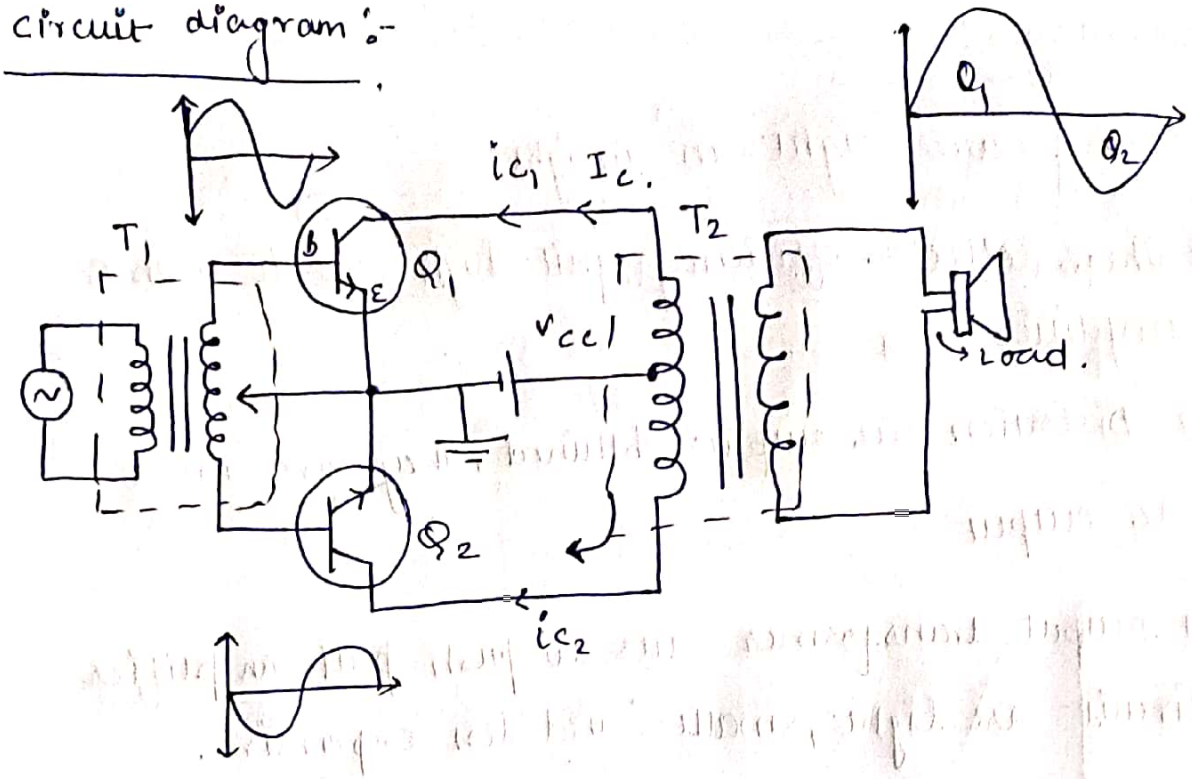
It is an amplifier which has an output stage than can drive a current in either direction through load.
output stage of Push-pull amplifier consists of two identical BJTs one sourcing current through load while other sinking the current from the load.

Class B Push Pull Amplifier:-

Centre tapped primary of output transformer combine the two half of cycle and form a complete sin wave output of secondary wave.

By proper impedance matching maximum power can be transferred to the load and load resistance R referred to primary side its value with be.

circuit diagram :-



$$I_{av} = \frac{(I_c)_{max}}{T_1}.$$

$$(P_{in})_{dc} = \frac{2 V_{cc} (I_c)_{max}}{T_1}.$$

$$(P_o)_{ac} = V_{rms} \cdot I_{rms}$$

$$= \frac{V_{cc}}{\sqrt{2}} \cdot \frac{(I_c)_{max}}{\sqrt{2}}$$

$$(P_o)_{ac.} = \frac{V_{cc} \cdot (I_c)_{max}}{2}.$$

$$\eta = \frac{(P_o)_{ac}}{(P_{in})_{dc.}} = \frac{V_{cc}(I_c)_{max} \times T_1}{2(2 V_{cc})(I_c)_{max}}$$

$$\boxed{\eta = \pi/4}$$

$$\boxed{\eta = 78.5\ \%}$$

Advantages :-

(i) They are light in weight

(ii) There collector efficiency quit high due to class B amplifier

(iii) Distortion free output obtained, they give more ac output

(iv) Output transformer less to push pull amplifier circuit are light, smaller and less expensive.

Disadvantages :-

(i) Two identical transformers are required

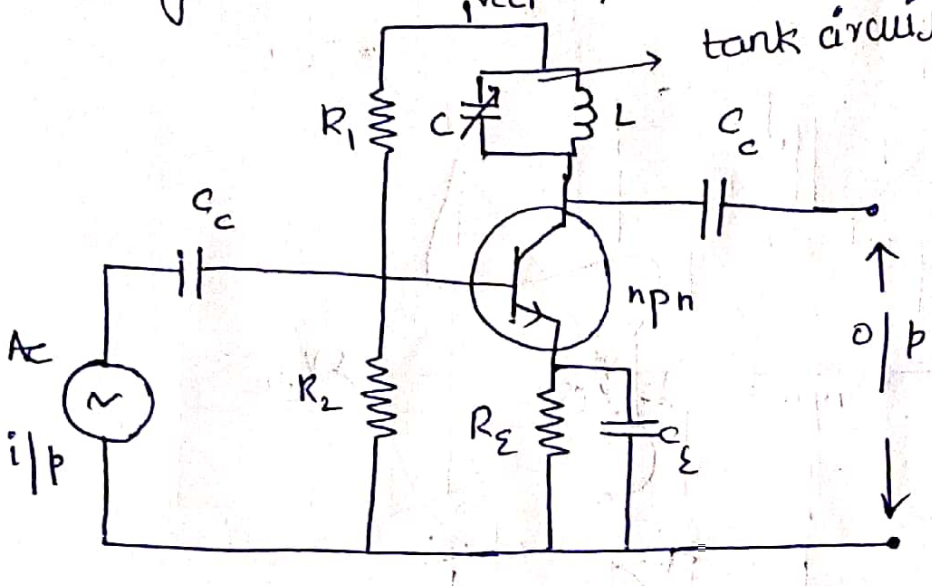
(ii) It required two equal and opposite voltage at input

(iii) If parameter of two transistor differ, there will be of unequal amplification of two haives of signal which introduce more distortion.

~~Cross / over distortion~~ :- 17/11/20.

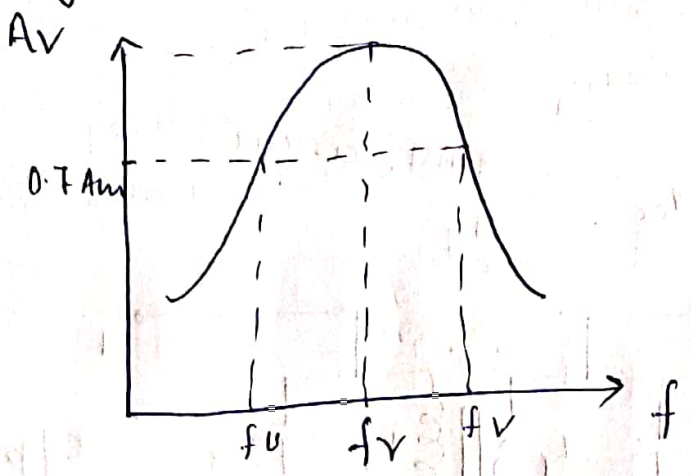
TUNED AMPLIFIER

(i) Single tuned amplifier :-



- R_1 and R_2 are biasing resistance
- n-p-n transistor.
- Tank circuit :- Because of this we can amplify the desire signal.
- V_{cc} :- ~~transistor~~ Make the Q point is active region.
- R_E :- Emitter resistance
- C_E = Bipass capacitor.

Frequency response curve.



f_r = Resonant frequency.

Band width = $f_v - f_u$.

Quality factor = f_r / band width.

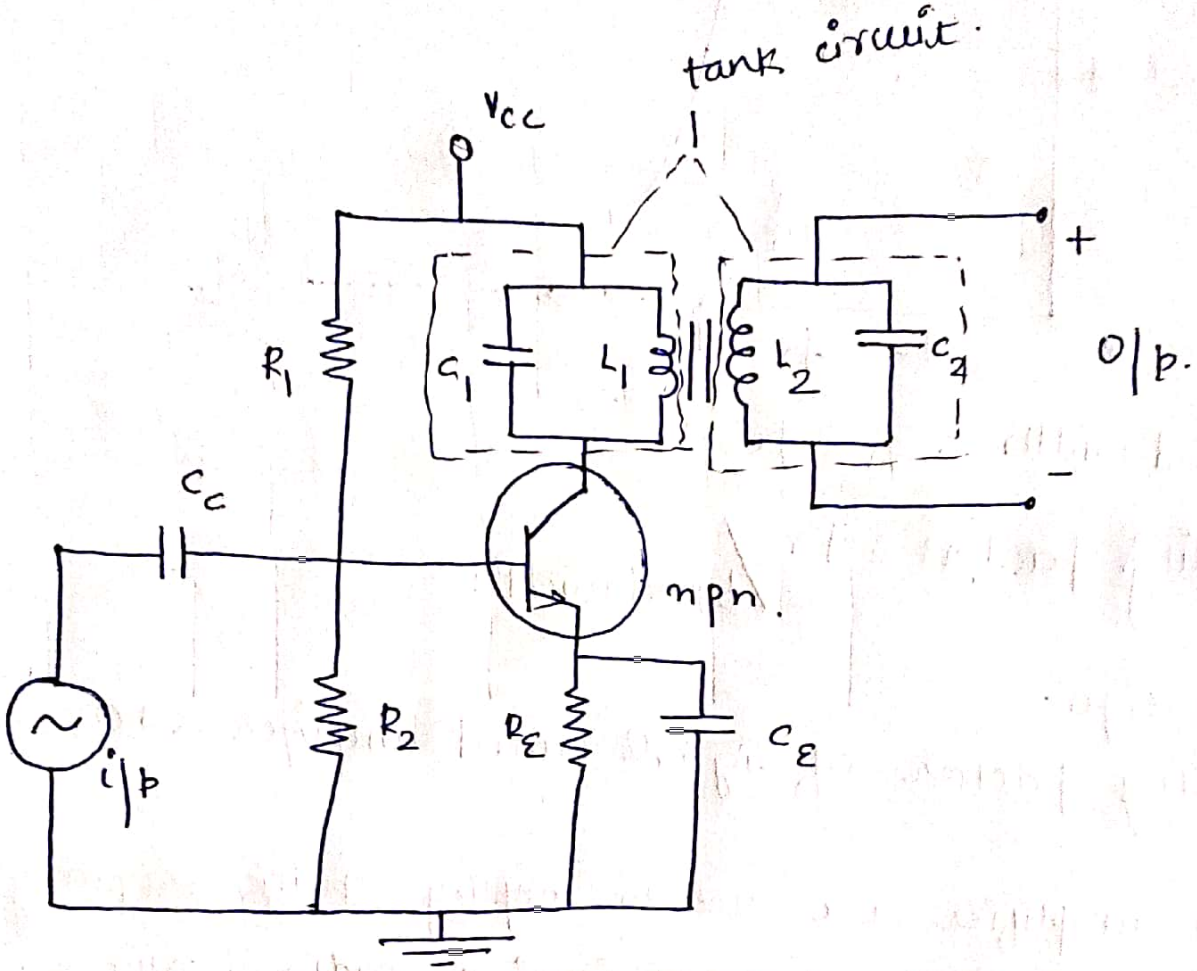
~~Quality~~ a.

Quality factor of signal tuned amplifer < 10.

Tuned Amplifier are use to amplify specific frequency signal. Basically high frequency signal or radio frequency. These are classified into 3 types.

- single tuned amplifier.
- Doubble tuned amplifier
- slagger tuned amplifiers.

(ii) Double Tuned amplifier :-



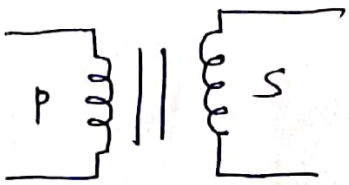
R_1, R_2, R_E :- Biasing resistance.

V_{CC} :- Help in making the Q-point stable in active region.

working of coupling capacitor :-

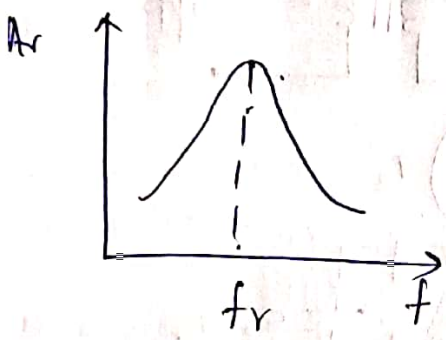
C_C = pass only Ac signal and block dc signal.

• Loose coupling.



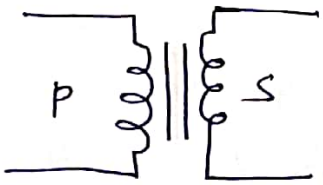
$$K = \frac{\text{Band width}}{fr.}$$

F.R.C

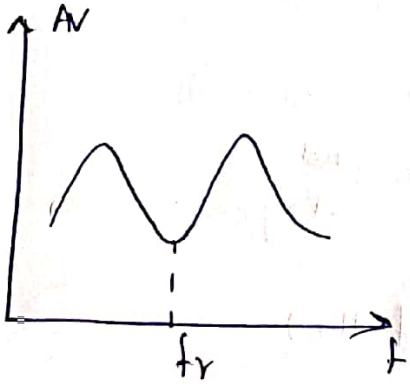


Resonance frequency is high

• Tight coupling.

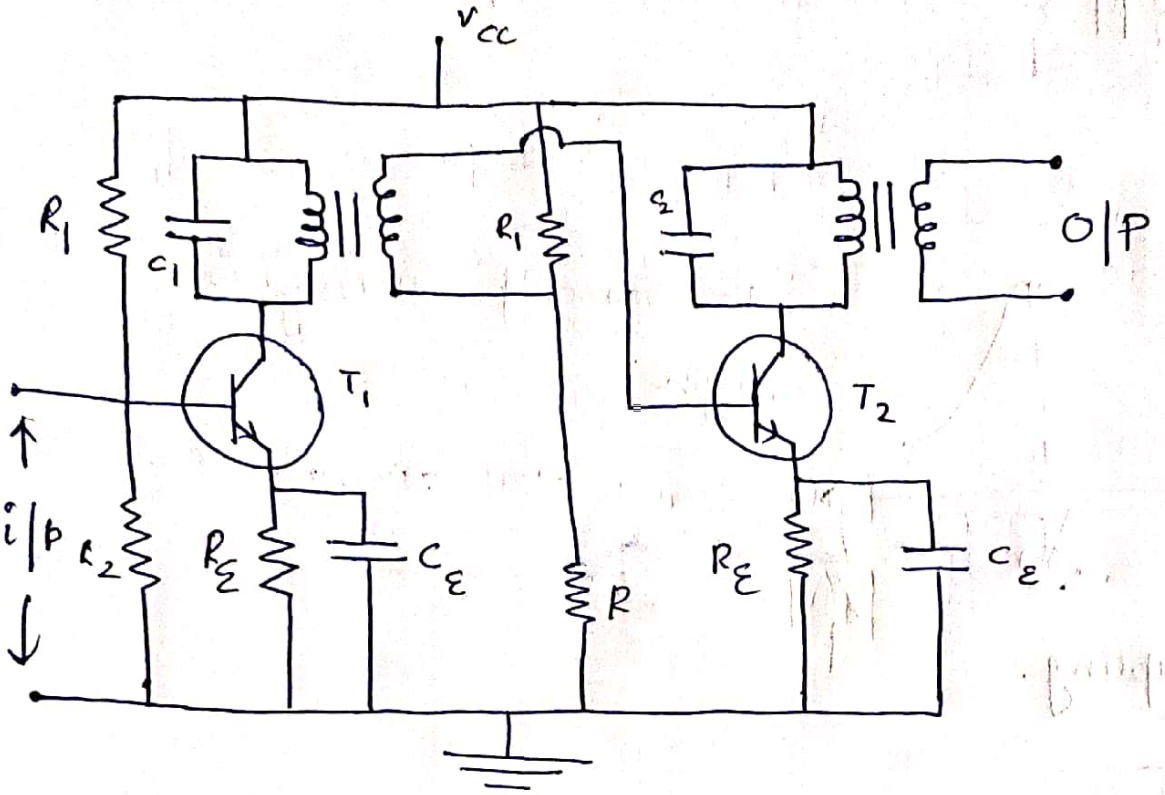


F R C.

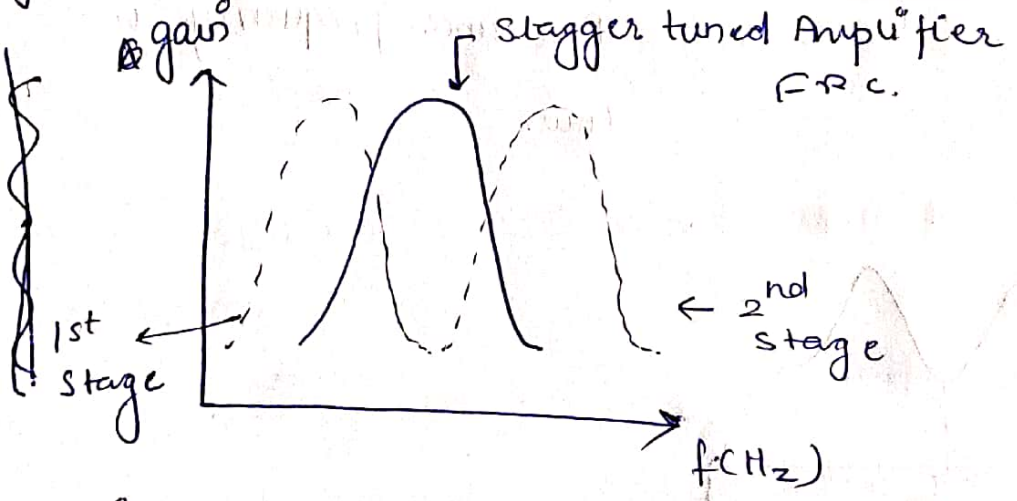


Resonance frequency is low.

(iii) Stagger tuned Amplifier.



Frequency response curve:-



advantage:-

(i) Max Band width.

(ii) Gain Band width factor is more.

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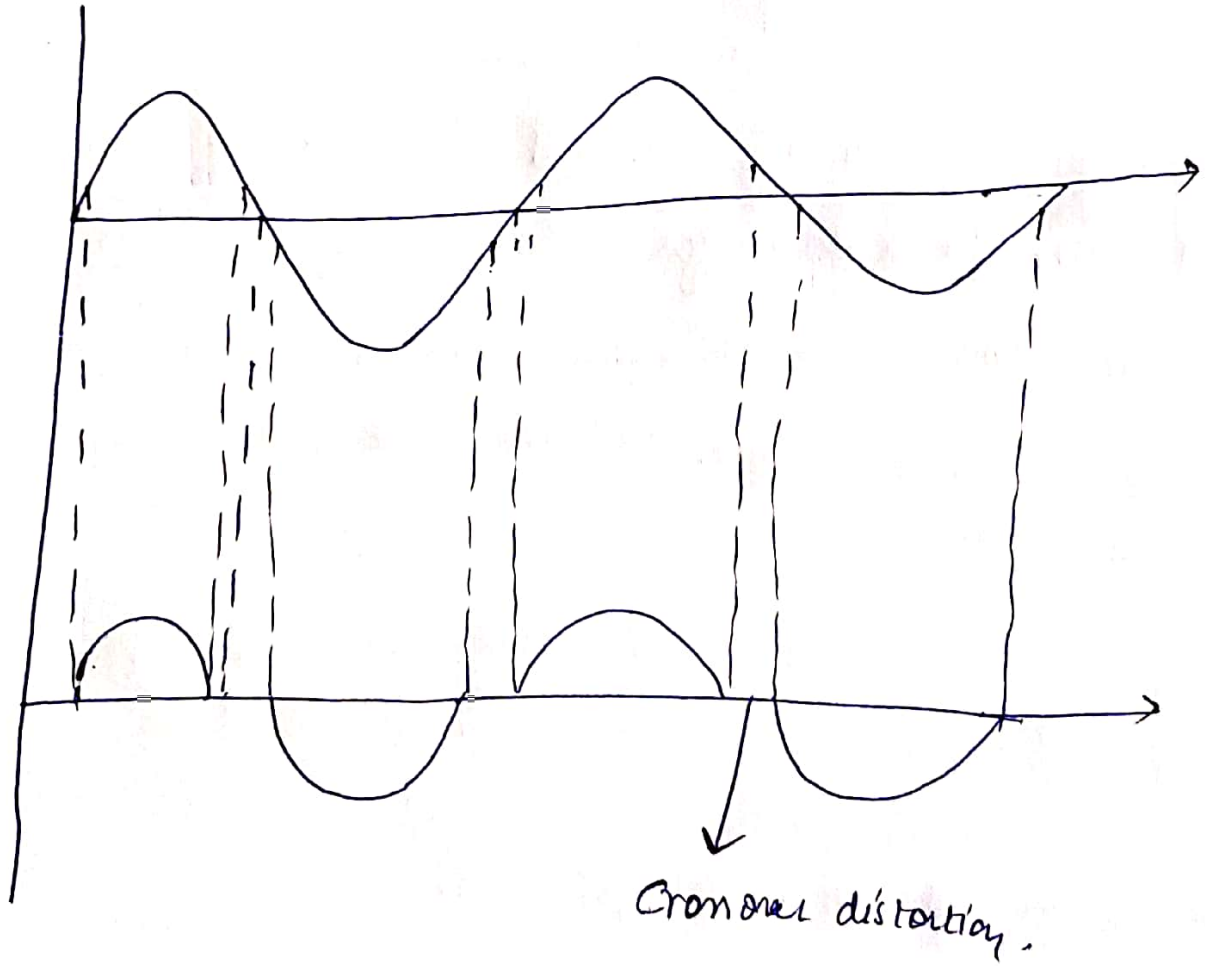
Cross over distortion:-

The silicon transistor used in class B push pull amplifier must have at least 0.5V to 0.6V of forward base-emitter bias before they will go into conduction but the forward bias produced by the input, both the transistor will be non conducting, when the input signal is approximately ±0.5V. This forms a dead band in the input and produces cross-over distortion in the output.



Harmonic Distortion:-

A signal is considered to have harmonic distortion when there are harmonic frequency components. If the fundamental frequency has an amplitude A_1 and the n^{th} frequency component has an amplitude A_n, a harmonic distortion can be defined as.

$$\%\ n^{th} \text{ harmonic distortion} = \frac{|A_n|}{|A_1|} \times 100\%$$