

ALM-3 Quiz / Test

- 1) At mid band frequency, the gain of CE amplifier is :
 Ans. a, Maximum
- 2) The lower cutoff frequency f_L in CE amplifier is mainly due to ?
 a, Bypass Capacitor & coupling Capacitor.
- 3) A CE amplifier has a mid-band gain of 100, $f_L = 100 \text{ Hz}$, $f_H = 100 \text{ kHz}$. Calculate the bandwidth and explain its importance!

Ans

Given data

$$1, \text{ mid-band gain} = 100$$

$$2, f_L = 100 \text{ Hz} \quad f_H = 100 \times 1000 = 100,000 \text{ Hz}$$

$$\text{Bandwidth} = f_H - f_L \rightarrow ①$$

$$= 100,000 \text{ Hz} - 100 \text{ Hz}$$

$$= 99,900 \text{ Hz}$$

Importance of bandwidth

→ bandwidth is important it changes the frequency an amplifier can effectively process, it's the difference the between highest & lowest frequency that circuit can amplify without signal loss.

→ a wide bandwidth is crucial for high fidelity audio system to reproduce both low bass tones and high pitched symbols accurately if the bandwidth is too narrow, the amplifier will "clip" or filter out the frequencies at the edges of audio spectrum, leading to loss of sound quality.

4) If base bias is increased, show the Q-point shifts on the load line, indicate whether moves towards saturation or cut-off!

Ans:

The Q-point represent the DC Value of Collector Emitter Voltage (V_{CE}) and collector Current (I_C)

With no input signal, it is located on the DC load line which graphically plot (I_C vs V_{CE})

i) Increasing Base bias (\rightarrow)

Increasing the base bias mean increasing the base current (I_B) following to the BJT.

ii) Effect on Collector Current (\rightarrow)

Since Collector Current is a function of the base current ($I_C = \beta \times I_B$), an increase I_B directly cause increase in I_C .

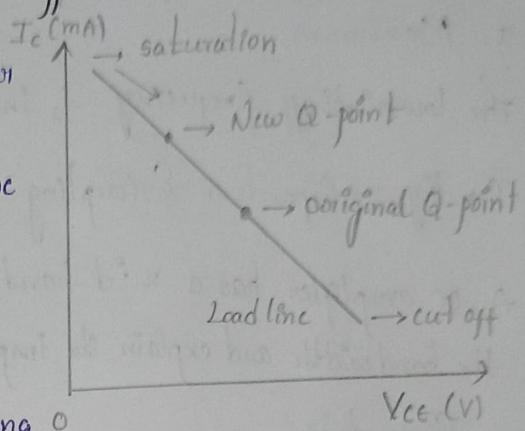
iii) Effect on Collector-Emitter Voltage (\rightarrow)

The de load line equation $V_{CE} = V_{CC} - I_C R_C$. As I_C increase, the voltage drop across collector-emitter resistor (R_C) increase.

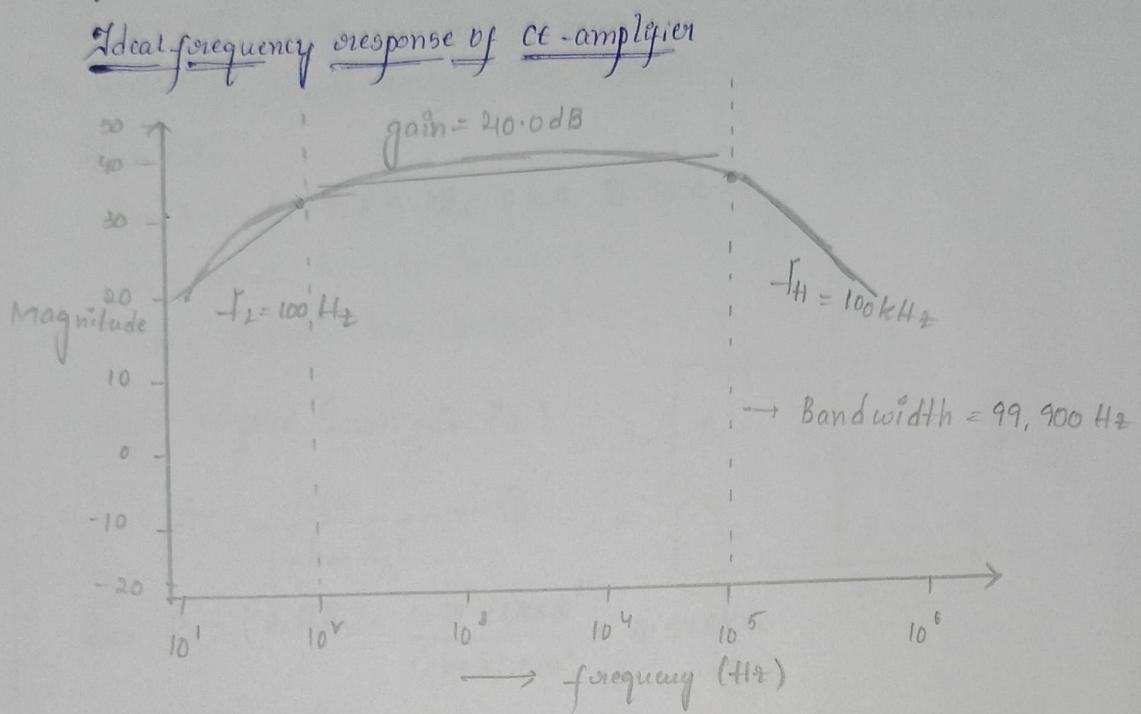
\therefore therefore Quiescent operating lies in 'Saturation region'.

Now explain in your own words why stabilizing Q-point is crucial for amplification?

Stabilizing the Q-point is crucial because it ensure the amplifier operates correctly and consistently. If the Q-point shifts, the output may distort and the transistor may go into Cut-off or Saturation. Temperature changes and transistor variation can move the Q-point. A stable Q-point keeps the signal with active region. This result is clear, undistorted amplification.



b) plot the ideal frequency response of CE amplifier and mark f_L , f_H bandwidth and midgain



- plotted an ideal CE amplifier frequency response.

Now write a short notes on what happens to amplifier performance if band width is too narrow?

If bandwidth is narrow of an amplifier is too narrow, it limits the range of frequency the amplifier can handle effectively

- only a small portion of signal input signal frequency range will be amplified properly.
- In audio system, for example, the sound may lack bass or treble making it unclear or flat
- The original shape of the signal might change, causing distortion.
- Narrow band will make the amplifier unsuitable for wide range signals like music, video, or complex data.