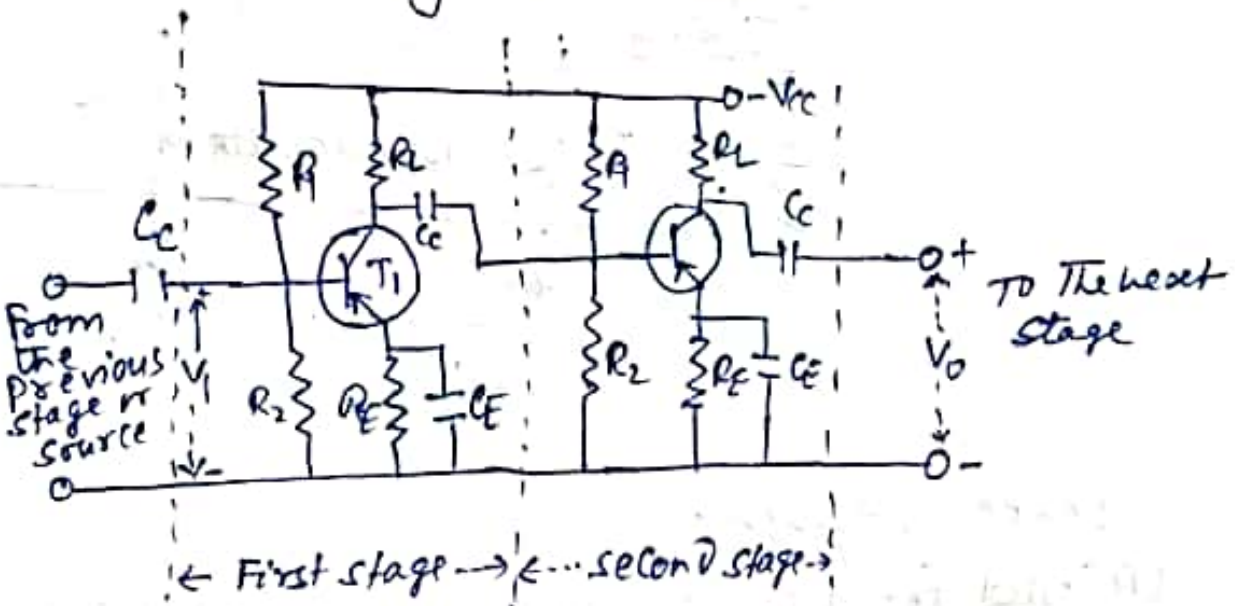
RC Amplifier

Unit-III

A cascaded amplifier for which the interstage coupling is provided by an R-C network is called an R-C Coupled amplifier. A two stage R-C Coupled CE-mode transistor amplifier is shown in fig (1). Here the output of the first stage is coupled to the input of the second stage via coupling capacitor C_C. This capacitor



Fig(1)

allows the a.c. components of the signal to pass through it but blocks the d.c. components of the first stage from reaching the input of the second stage. The resistors R_1, R_2 and R_E are used to establish the quiescent operating point. The by-pass capacitor C_E across R_E offers negligible reactance at the lowest frequency of the signal.

Frequency Response Characteristic :→
The variation of gain of the amplifier with frequency is termed as the frequency response characteristics of the amplifier. The frequency response characteristics of an RC coupled amplifier is shown in fig (2). This characteristic is devided into

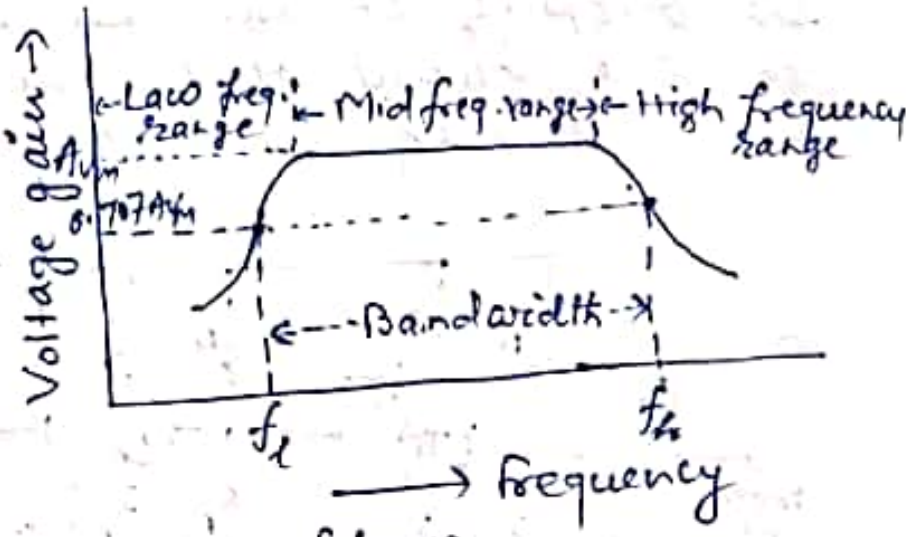


fig (1)

three regions.

(i) Mid frequency range:— The frequency range over which the gain of the amplifier is approximately constant is called "mid-frequency range."

(ii) Low-frequency range:- where the gain decreases with decreasing frequency below the mid frequency range is called the "low-frequency range."

(iii) High frequency range:— where the gain decreases with increasing frequency, above the mid frequency range. is Called " High frequency range."

Explanation:-

The decrease in gain with decreasing frequency in the low-frequency range is due to the coupling capacitor C_c. Since the reactance of a capacitor increases with decreasing frequency, the voltage drop across ~~this~~ capacitor becomes larger as the frequency is decreased. The high frequency response is mainly governed by the capacitances that appear in shunt across the output. These capacitances consists of the collector capacitance of the transistor and the stray wiring capacitances. The fall of h_{fc} with increasing frequency is also responsible for the high-frequency drop-off in gain.

Band width:- In the response characteristic of the amplifier, we can define two frequencies called the half-power ~~frequencies~~ frequencies. The frequency ~~in the low frequency band~~ corresponding to the point of characteristics for which voltage gain is $\frac{1}{\sqrt{2}}$ times i.e 0.707 times the mid frequency voltage gain in the low frequency range is known as "lower half power frequency (f_l)" and the same thing in the high frequency range is known as the "upper half-power frequency (f_h). The frequency difference ($f_h - f_l$) gives a measure of the "bandwidth" of the amplifier.