Ques: What is an Amplifier?

Ans: Amplifier is a device that is used to increase the power, current or voltage of a signal. Amplifie are used in wireless communications and broadcastin and in audio equipment of all kind.

Ques: Define the classification of amplifiers?

Ans: The transistor amplifiers may be classified as to their usage, frequency, capabilities, coupling methods and mode of operation.

(1) According to use: The classification of amplifiers as to usage are basically voltage amplifiers, and power amplifiers.

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(II) According to frequency capabilities : According to frequency capabilities, amplifiers are classified as audio amplifiers, radio frequency amplifiers.

(III) According to coupling methods : According to coupling methods amplifiers are classified as R-C coupled amplifiers, transformers coupled amplifiers.

(IV) According to mode of operation : According to mode of operation amplifiers are classified as class A, class B and class C amplifiers.

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Ques:- How does transistors works as an amplifiers:-

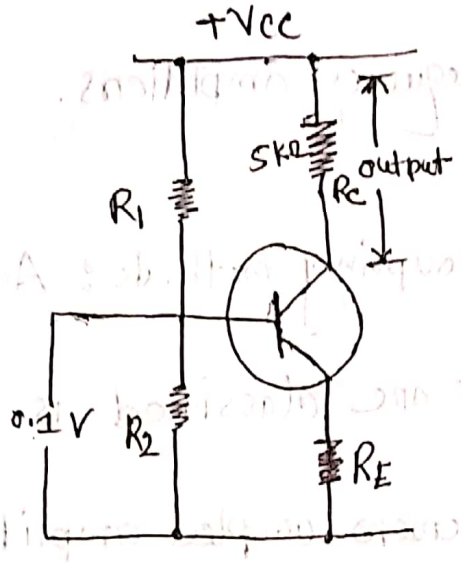

fig: 1

Fig 01 shows a single stage transistor amplifier. When a week a.c signal is given to the base of transistor a small base current (which is a.c) starts following. Due to transistor action, a much largerr a.c current flows through the collector load R_C. As the value of R_C is quite high (usually 4–10 KΩ), therefore, a large voltage appears across R_C. Thus a week

Signal applied in the base circuit appears in amplified form in the collector circuit. It is in this way that a transistor acts as an amplifier.

The action of transistor amplifier can be beautifully explained by referring to fig-01. Suppose a change of 0.1 V in signal voltage produces a change of 2mA in the collector current. Obviously, a signal of 0.1 V applied to the base will give an output voltage = 2mA × 5KΩ = 10V. Thus the transistor has been able to raise the voltage level from 0.1 to 10V.

*Ques: Graphical representation/Demonstration of Transistor Amplifier.

The function of transistor as an amplifier can also be explained graphically. Fig-02 shows the output characteristics of a transistor in CE configuration.

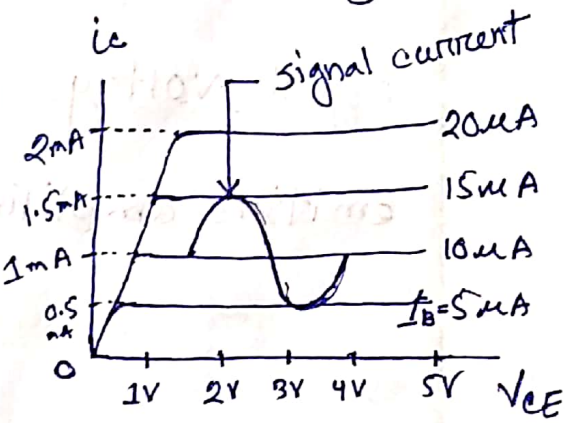

fig-02

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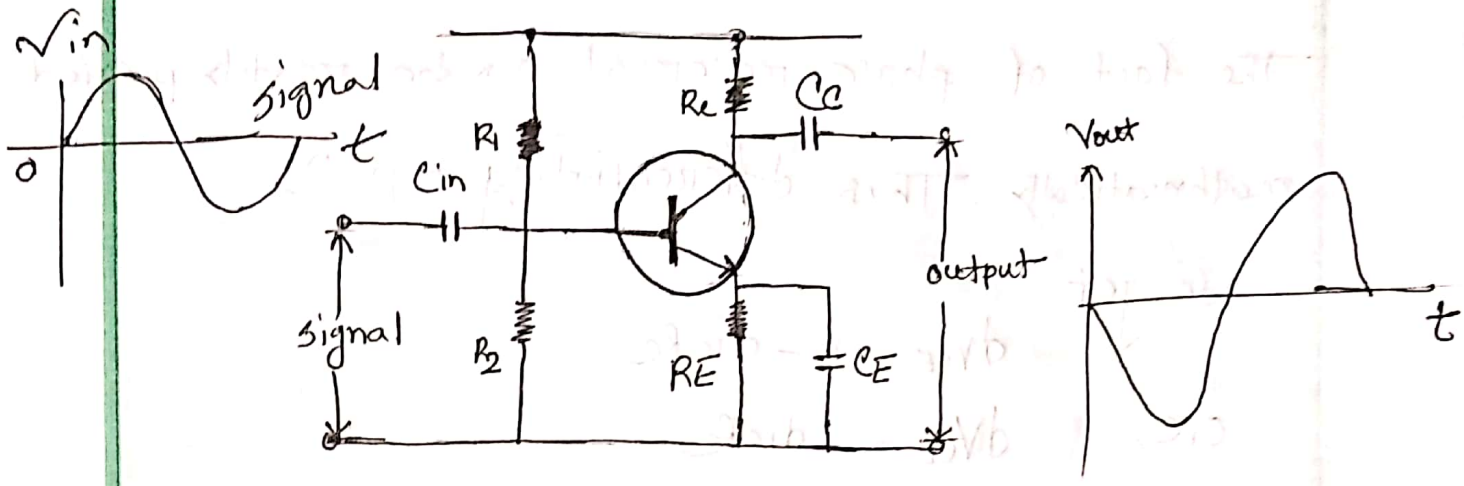
Suppose the zero signal base current is 10μA. i.e this is the base current for which the transistor is biased by biasing network. When an a.c signal is applied to the base, it makes the base, say positive in the first half cycle and negative in the second half cycle. Therefore, the base and collector current will increase in the first half cycle when base-emitter junction is more forward biased. However, they will decrease in the second when the base emitter junction is less forward biase

Explain phase reversal of a transistor amplif

Ans:- The phase difference of 180° between the signal voltage and output voltage in a common emitter amplifier is known as phase reversal.



When the signal voltage increases in the positive half cycle, the base current also increase. The result is that collector current and hence voltage drop ICRC increase. As Vcc is constant, therefore, output voltage Vce is decrease. In other word, As the signal voltage is increasing in the positive half-cycle, the output voltage is increasing in the negative sense, i.e. output is 180° out of phase with the input. It follows, therefore, that in a common emitter amplifier, the positive half-cycle of the signal appears as amplified negative half cycle in the output and vice versa.

It may be noted that amplification is not affected by these phase reversal.

The fact of phase reversal can be readily prove mathmatically. Thus differentiating exp (i), we get,

$$dV_{CE} = 0 - d_i R_c$$

OTC,

$$dV_{CE} = - d_i R_c$$

The negative sign show that output voltage is 180 out of phase with the input signal voltage.

D.C. equivalent circuit :-

In this dc equivalent circuit of a transistor amplifier, only d.c conditions are to be considered i.e it is presumed (অনুমান করা) that no signal is applied. As direct current can not flow through a capacitor, therefore, all the capacitor looks like an open circuit in this d.c equivalent circuit.

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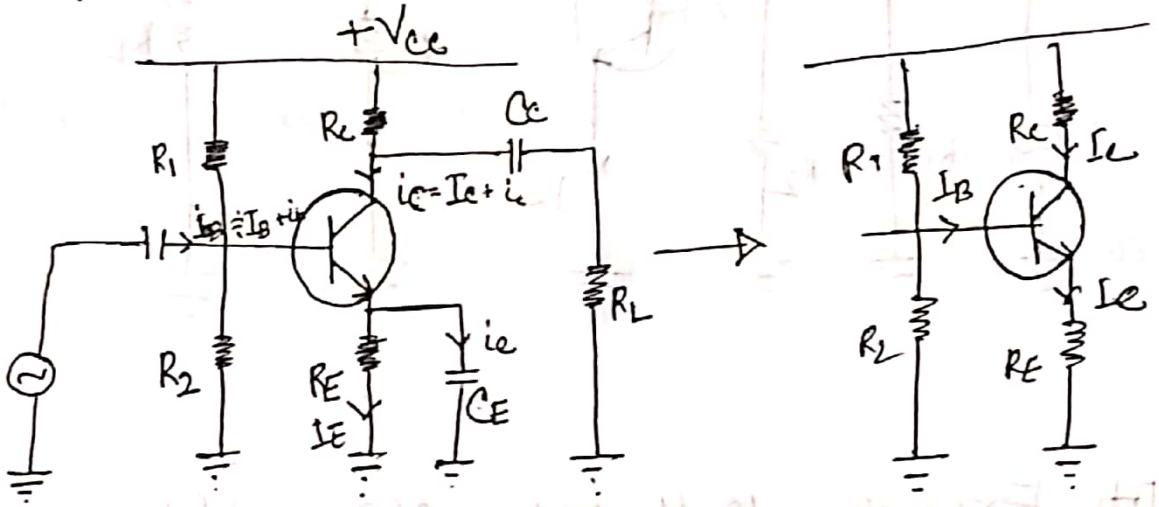
Draw the equivalent circuit by following two steps:

(i) Reduced all a.c source to zero.

(ii) Open all the capacitors.



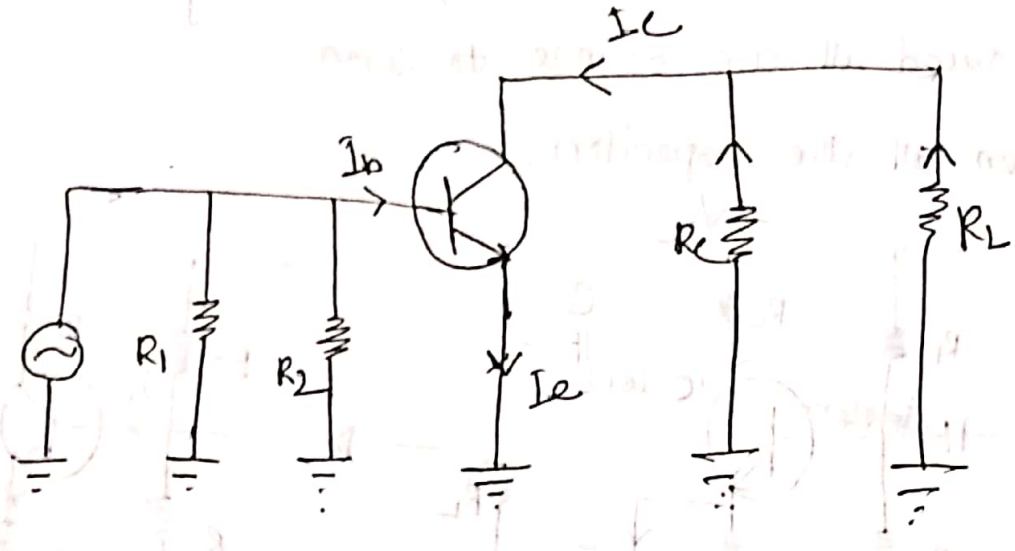
A.C. equivalent circuit :-

In the a.c equivalent circuit of a transistor amplifiers, only a.c conditions are to be considered. Obeously d.c voltage is not important for a circuit and may be considered zero.

Draw the a.c equivalent circuit by the following two ~~spe~~ step:

(i) reduce all the d.c source to zero.

(ii) short all the capacitors.



Example: 10.4 page-259 in p.d.f book is very important.

Define power amplifier:

A power amplifier is an electronic amplifier designed to increase the magnetude of power of a given input signal. The power of the input signal is increased to a level high enough to drive loads of output devices like speakers.

headphone, RF transmitter etc. Unlike voltage/current amplifiers, a power amplifier is designed to drive load directly and used as a final block in an amplifier chain.

Difference between voltage and power amplifier: