SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

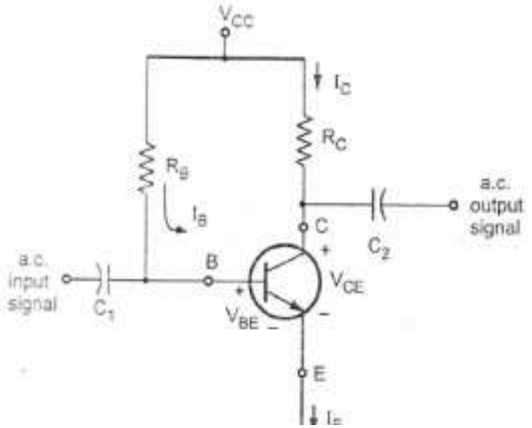
COURSE NAME : **19EC304 – ELECTRONIC CIRCUITS I**

II YEAR / III SEMESTER

Unit I- **BIASING OF DISCRETE BJT,FET**

Topic : Fixed bias and problems

Fixed Bias (Base Resistor Bias)



$$X_C = 1 / 2\pi fC = 1 / 2\pi(0)C = \infty.$$

The Figure shows the fixed bias circuit. It is the simplest d.c. bias configuration. For the d.c. analysis we can replace capacitor with an open circuit because the reactance of a capacitor for d.c. is

In the base circuit,

Apply KVL, we get

$V_{CC} = I_B R_B + V_{BE}$

Therefore,

$I_B = (V_{CC} - V_{BE})/R_B$

For a given transistor, V_{BE} does not vary significantly during use. As V_{CC} is of fixed value, on selection of R_B, the base current I_B is fixed. Therefore this type is called *fixed bias* type of circuit.

Apply KVL, we get

$V_{CC} = I_C R_C + V_{CE}$

Therefore,

$V_{CE} = V_{CC} - I_C R_C$

The common-emitter current gain of a transistor is an important parameter in circuit design, and is specified on the data sheet for a particular transistor. It is denoted as β.

$$I_C = \beta I_B$$

$$I_C = \frac{V_{CC} - V_{CE}}{R_C}$$

$$V_{BE} = V_B$$

$$V_{CE} = V_C$$

$$V_{BE} = V_B$$

$$V_{CE} = V_C$$

In this circuit $V_E = 0$

Stability Factor

By applying Kirchhoff's voltage law to the collector circuit, we get,

$$I_B \cong \frac{V_{CC}}{R_B}$$

When I_B changes by ∂I_B, V_{CC} and V_{BE} are unaffected.

$$\therefore \frac{\partial I_B}{\partial I_C} = 0 \quad \because I_C \text{ is not present in the equation.}$$

Substituting this value in equation , we get,

$$S = \frac{1+\beta}{1-\beta(\partial I_B / \partial I_C)} = \frac{1+\beta}{1-0}$$

$$\therefore \quad S = 1+\beta$$

Merits:

It is simple to shift the operating point anywhere in the active region by merely changing the base resistor (R_B).

A very small number of components are required.

Demerits:

The collector current does not remain constant with variation in temperature or power supply voltage. Therefore the operating point is unstable.

Changes in V_{be} will change I_B and thus cause R_E to change. This in turn will alter the gain of the stage.

When the transistor is replaced with another one, considerable change in the value of β can be expected. Due to this change the operating point will shift.

For small-signal transistors (e.g., not power transistors) with relatively high values of β (i.e., between 100 and 200), this configuration will be prone to thermal runaway. In particular, the stability factor, which is a measure of the change in collector current with changes in reverse saturation current, is approximately β+1. To ensure absolute stability of the amplifier, a stability factor of less than 25 is preferred, and so small-signal transistors have large stability factors.

Any Query????

Thank you……