SNS COLLEGE OF TECHNOLOGY

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Department of Biomedical Engineering

Course Name: 23BMB101-Electron Devices and Circuits

I Year : II Semester

Unit II –Transistors

1

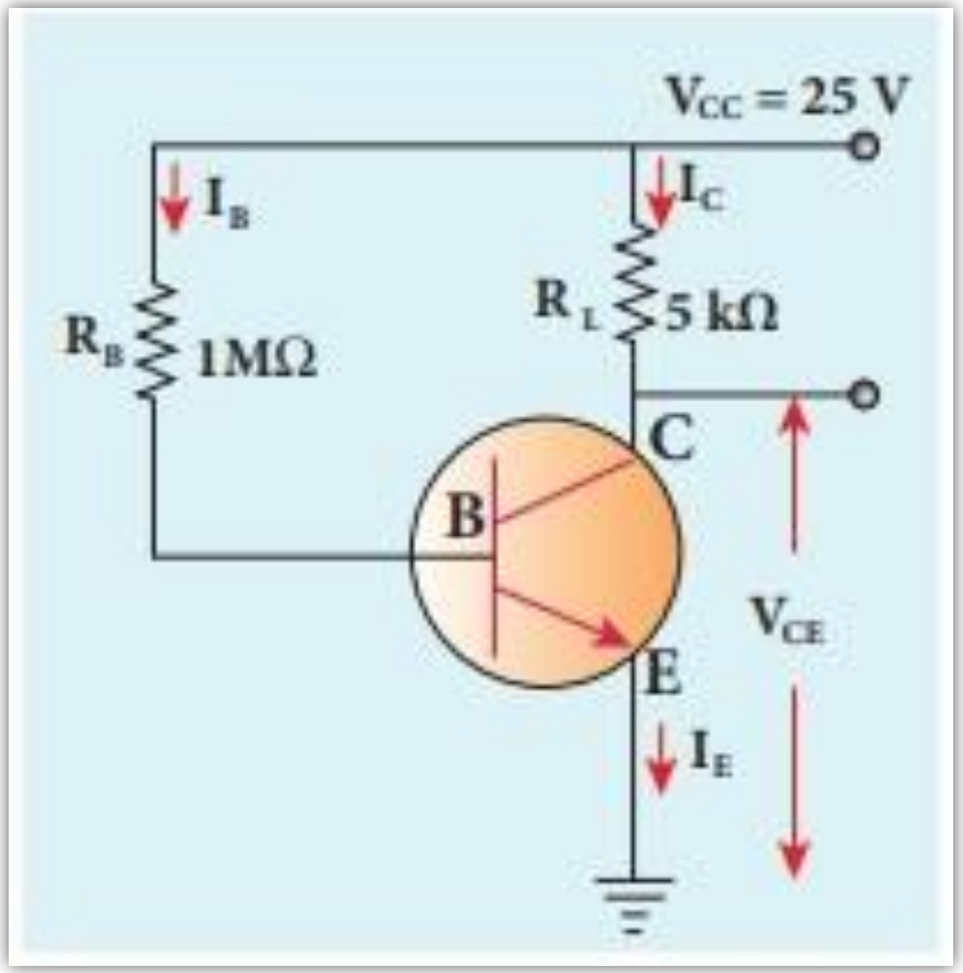
Topic : Bipolar Junction Transistor

INTRODUCTION

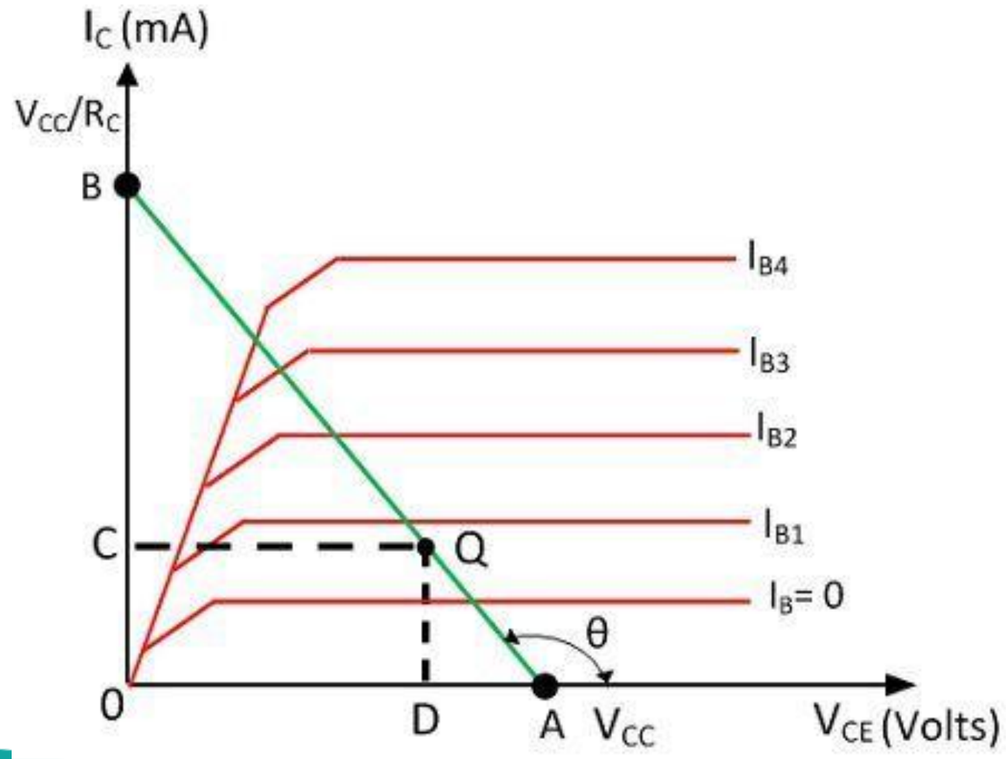
- Transistors used in amplifier circuits must be biased into an ON state with constant levels of collector, base and emitter current and also constant terminal voltages.
- The levels of I_C and V_{CE} define the transistor dc operating point or quiescent point.
- The circuit that provides this state is known as a bias circuit.
- The best bias circuits have the greatest stability; they hold the currents and voltages substantially constant regardless of the current gain and variations in temperature.

DC Load Line and Bias Point

- The operating point is a point where the transistor can be operated efficiently. A line that is drawn with the values VCC (when IC = 0) and IC (when VCE = 0) is called the dc load line.
- The dc load line superimposed on the output characteristics of a transistor is used to learn the operating point of the transistor.



DC Loa Line and Bias Point



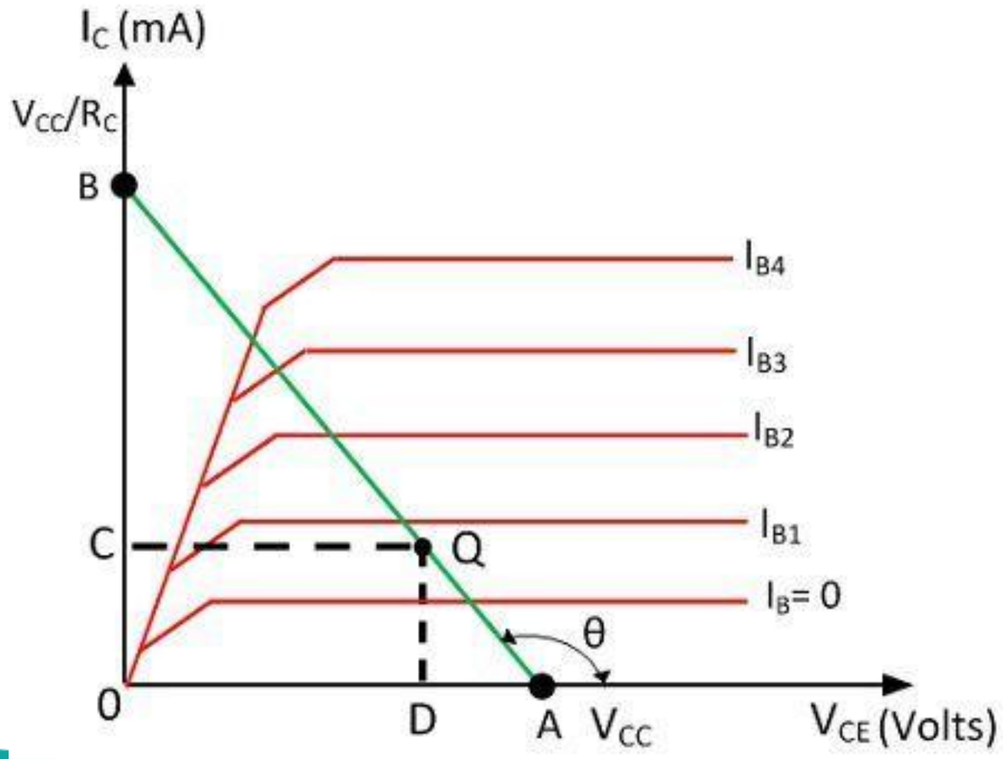
- By applying Kirchhoff's voltage law to the collector circuit, we get,

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

$$V_{CE} = V_{CC} - I_C R_C \ldots . equ(1)$$

- The above equation shows that the V_{CC} and R_C are the constant value, and it is the first-degree equation which is represented by the straight line on the output characteristic.
- This load line is known as a DC load line.

DC Load Line and Bias Point



- 1. The collector-emitter voltage VCE is maximum when the collector current IC = 0 then from the equation (1) we get,

$$V_{CE} = V_{CC} - 0 \times R_C$$

$$V_{CE} = V_{CC}$$

- The first point A (OA = VCC) on the collector-emitter voltage axis.
- The collector current I_C becomes maximum when the collector-emitter voltage V_{CE} = 0 then from the equation (1) we get

$$0 = V_{CC} - I_C R_C$$

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

DC Bias Point – Q POINT

- The dc bias point or quiescent point (Q-point) (also known as the dc operating point) identifies the transistor collector current and collector-emitter voltage when there is no input signal at the base terminal.