

COMMON EMITTER CONFIGURATION

⇒ The emitter terminal is common between input and output sides.

⇒ Input is measured between Base and emitter

⇒ output is measured between Emitter and the collector.

⇒ To use this transistor as an amplifier, the Base-emitter junction is forward biased and the collector-Base junction is reverse biased.

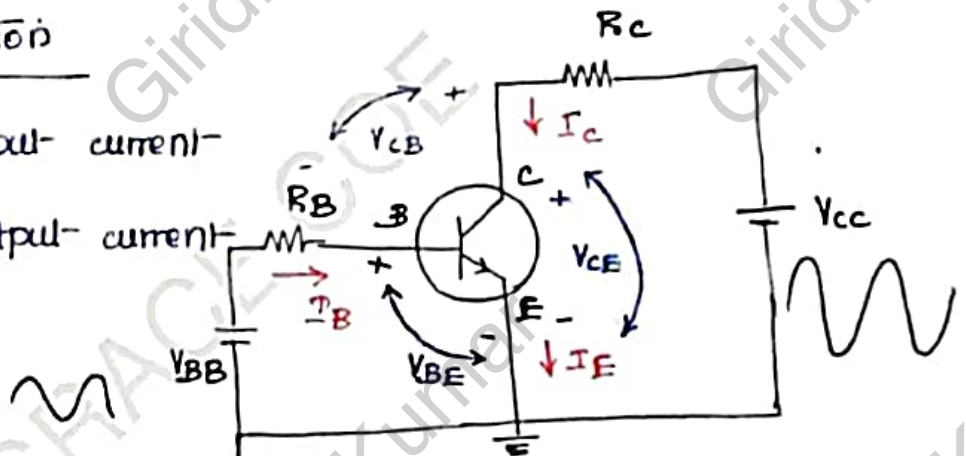
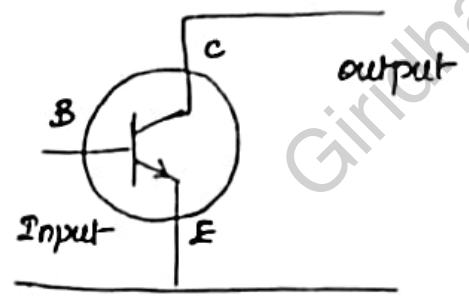
⇒ Schematic representation

* Base current, I_B - input current -

collector current, I_C - output current -

* Input voltage, V_{BE}

output voltage, V_{CE}



⇒ When we apply an AC signal between the BE terminal, we will get an amplified signal at CE terminal.

INPUT CHARACTERISTICS - relation between I_B and V_{BE}

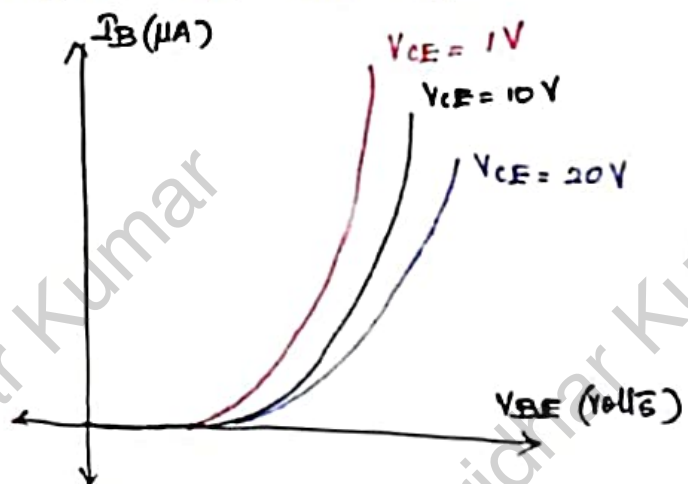
⇒ The curves are similar to the forward characteristics of the PN junction diode.

⇒ BE junction is forward-biased

⇒ As V_{CE} increases, I_B increases

⇒ $V_{CE} = V_{CB} + V_{BE}$

For fixed voltage of V_{BE} , as V_{CE} increases V_{CB} also



As $V_{CB} \uparrow$, the reverse bias applied between collector and base terminal also increases. - This increases the width of the depletion region and the 'effective' base width reduces.

⇒ Due to this the probability of recombination in the Base region reduces, and the electrons get collected at collector terminal which causes reduction in I_B .

⇒ As $V_{CE} \uparrow \rightarrow I_B \downarrow$.

output characteristics - relation between I_C and V_{CE}

* Active Region ①

⇒ As $I_B \uparrow$, $I_C \uparrow$

unlike CB configuration, as $V_{CE} \uparrow$ I_C also $\uparrow$ - curves are not flat.

$$V_{CE} = V_{CB} + V_{BE}$$

As $V_{CB} \uparrow$ due to increase in V_{CE} , the depletion region increases and the effective width of base terminal reduces. - recombination reduces and more electrons collected at the collector increasing I_C .

⇒ Base current I_B gets amplified by a factor of β .

$$\text{current gain } \beta = \frac{I_C}{I_B}$$

$$\beta_{AC} = \frac{\Delta I_C}{\Delta I_B}$$

⇒ During active region, the input current gets amplified by β .

