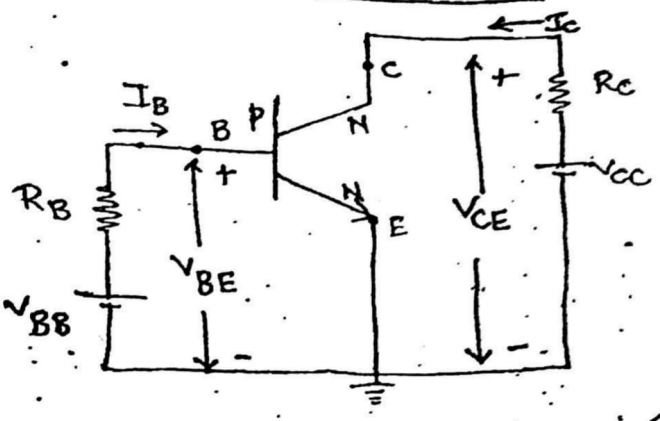
Common Emitter characteristics :-



$V_{CC} >> V_{BB}$

Inputs (V_{BE}, I_B)

o/p (V_{CE}, I_C)

i/p char.

$V_{BE} = f[I_B, V_{CE}]$

$I_C = f[I_B, V_{CE}]$

o/p char.

For a BJT Transistor

Dependents (V_{BE}, I_C)

Independents (V_{CE}, I_B)

Input characteristics :-

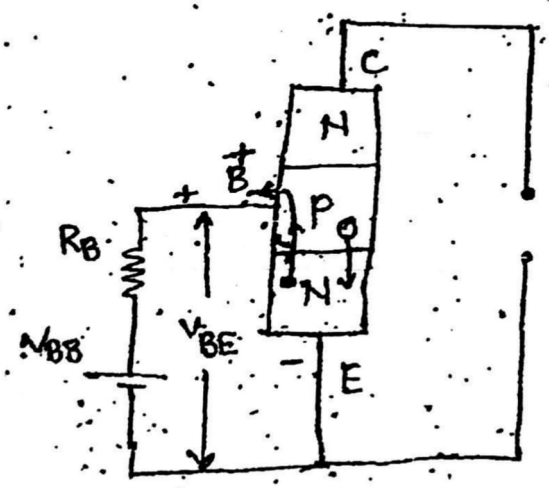
V_{BE} Vs I_B when V_{CE} = const

(i) 'C' & E $\rightarrow$ o.c

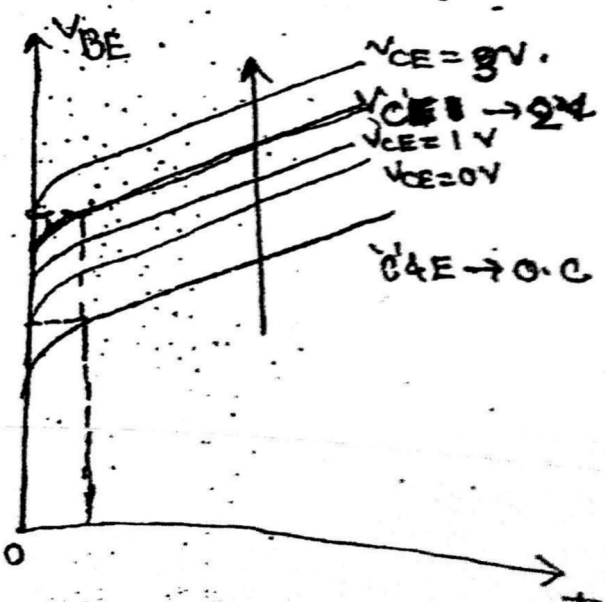
(ii) 'C' & E $\rightarrow$ s.c i.e $V_{CE} = 0V$

(iii) $V_{CE} \neq 0V$.

case(i) : when 'C' & 'E' $\rightarrow$ o.c

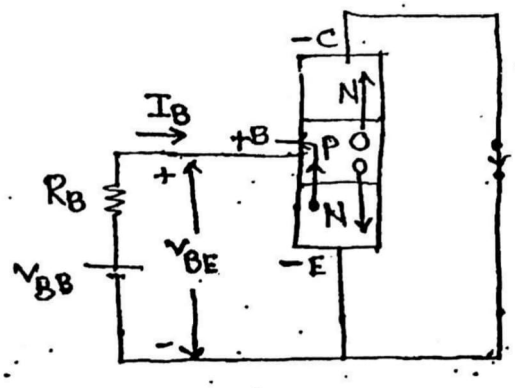


The char. of the transistor in this case is similar to the char. of a F.B PN jn diode with axes interchanged.



Case (ii) when 'e' & E → S.C

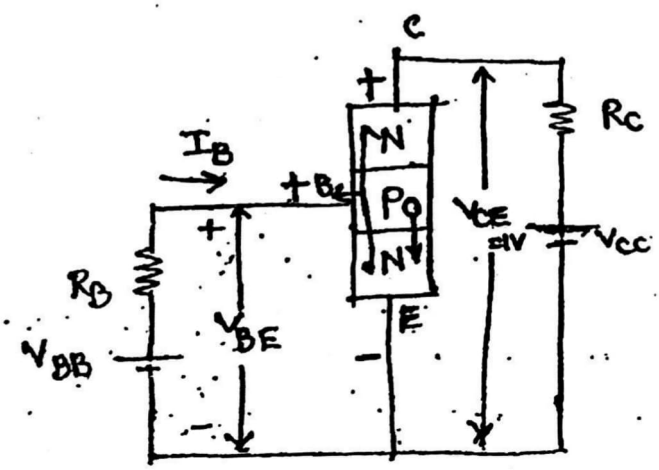
$V_{CE} = 0V$



* All the maj. carriers of 'E' collected by 'B'. There is no change in current due to $\bar{e}$ b/w 'B' & 'E' in case (i) & case (ii)
* The no. of holes collected by the 'E' from the Base ↓
∴ The hole current b/w 'B' & E = ↓

* To maintain I_B as const. increases the V_{BE} value.
i.e to get a particular value of I_B the req. value of V_{BE} is More in this case compared to case (i).

Case (iii) when $V_{CE} \neq 0$ Let $V_{CE} = 1V$.



$V_{BE} = V_\gamma$

$V_B - V_E = V_\gamma$

$\boxed{V_B = V_\gamma + V_E}$

$\boxed{V_C = 1 + V_E}$

$V_C > V_B$

* The no. of $\bar{e}$'s collected by 'B' from 'E' ↓
The $\bar{e}$ current b/w 'B' & 'E' ↓
The no. of holes collected by 'E' from B ↑.
The hole current b/w 'B' & 'E' ↑
∴ The resultant current 'B' & E ↓, I_B ↓
To maintain I_B as constant ↑ V_{BE} i.e to get a

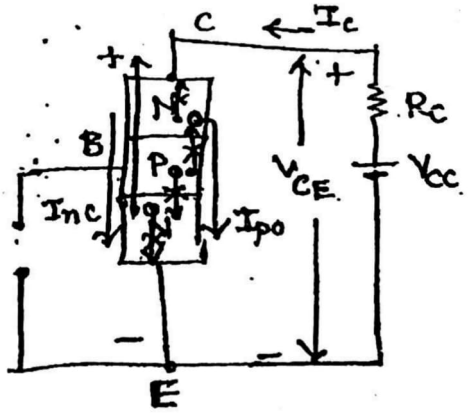
Particular value of I_B the required value of V_{BE} is more in this case compared to case (ii).

Output characteristics:-

I_C Vs V_{CE} when I_B = const $\begin{cases} I_B = 0 \\ I_B \neq 0 \end{cases}$

Case (i):- when $I_B = 0$

→ B & E terminals are O.C

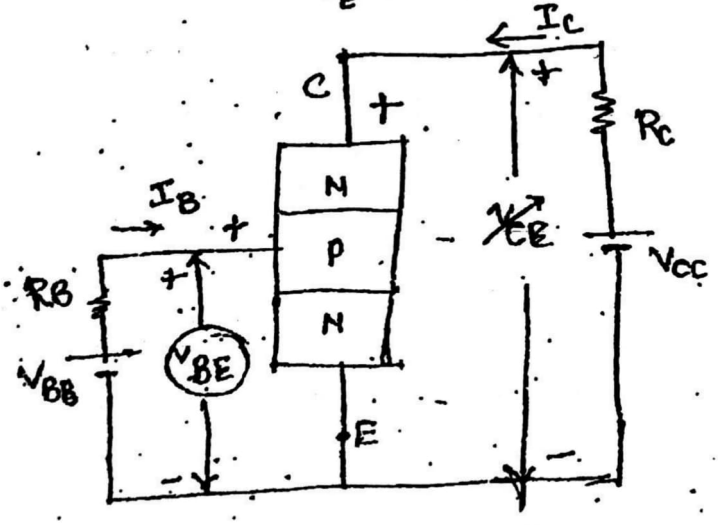


$I_C = I_{nc} + I_{po}$

As V_{CE} ↑ I_C ↑

case (ii):- when $I_B \neq 0$ Let $I_B = 5\mu A$.

'J_E' must be F.B



$V_{CE} = 0$

$V_C = V_E$

$V_B = V_\gamma + V_E$.

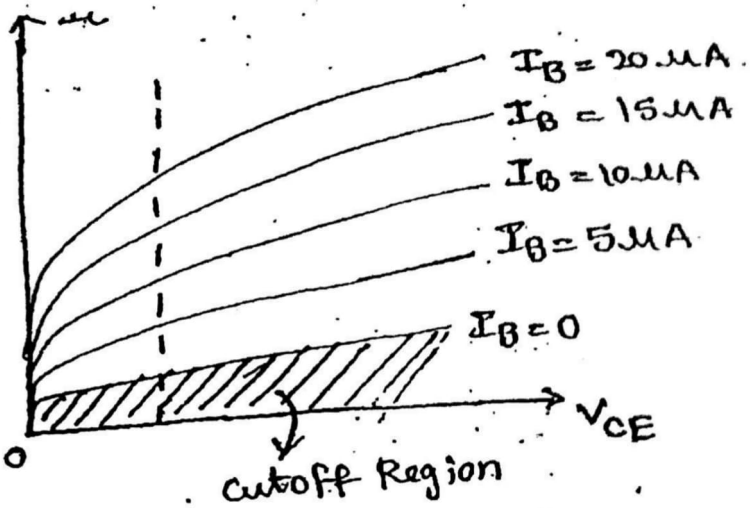
As V_{CE} ↑

(i) when $V_{CE} < V_{BE}$ ⇒ J_C → F.B

→ Saturation Region.

(ii) when $V_{CE} > V_{BE}$ ⇒ J_C → R.B

→ Active Region.



* The common collector characteristics are similar to common emitter characteristics. In i/p characteristics V_{BE} replaced by V_{CB}. In o/p characteristics I_C replaced by I_E.

* The phase shift b/w i/p & o/p for

(i) CB $\rightarrow 0^\circ$

(ii) CE $\rightarrow 180^\circ$

(iii) CC $\rightarrow 0^\circ$.

* CB $\begin{cases} \text{i/p} - I_E \\ \text{o/p} - I_C \end{cases} \Rightarrow +I_C = +I_E - I_B$ (0°)

* CE $\begin{cases} \text{i/p} \rightarrow I_B \\ \text{o/p} \rightarrow I_C \end{cases} \quad +I_C = +I_E - I_B$ (180°)

* CC $\begin{cases} \text{i/p} \rightarrow I_B \\ \text{o/p} \rightarrow I_E \end{cases} \quad +I_E = +I_C + I_B$ (0°)