* Ripple Factor (γ)

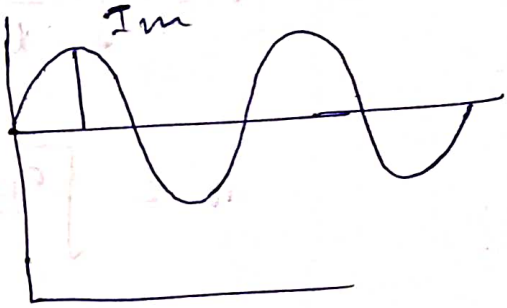
The AC components present in the output of DC is known as Ripple factor. It is denoted by γ

γ = rms value of ac component value of DC component

$$\gamma = \frac{I_{ac}}{I_{DC}}$$

It should be minimum as possible for effective rectifier

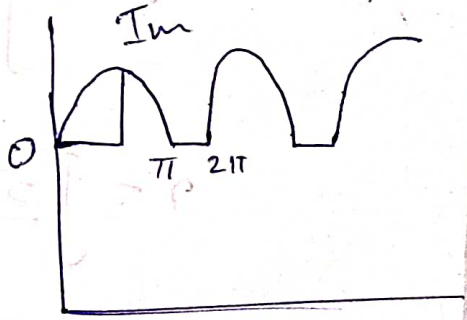
* Mathematical Analysis :-



$$I_{rms} = \sqrt{I_{dc}^2 + I_{ac}^2}$$

$$I_{ac} = \sqrt{I_{rms}^2 - I_{dc}^2}$$

$$\frac{I_{ac}}{I_{dc}} = \frac{1}{I_{dc}}\sqrt{I_{rms}^2 - I_{dc}^2}$$



$$\frac{I_{ac}}{I_{dc}} = \frac{1}{I_{dc}}\sqrt{I_{rms}^2 - I_{dc}^2}$$

$$= \sqrt{\frac{I_{rms}^2}{I_{dc}^2} - 1} = \gamma \quad \text{---(1)}$$

1.

For HWR

$$I_{rms} = \frac{I_m}{2}$$

$$I_{dc} = \frac{I_m}{\pi}$$

} ——— (2)

Putting the value of (2) in (1)

$$\gamma = \sqrt{\frac{I_{rms}^2}{I_{dc}^2} - 1}$$

$$\gamma = \sqrt{\frac{I_m^2}{2^2 (I_m)^2} \times \pi^2 - 1}$$

$$\gamma = \sqrt{\frac{\pi^2}{4} - 1}$$

$$\gamma = \sqrt{\frac{9.8596}{4} - 1}$$

$$\gamma = \sqrt{\frac{9.8596 - 4}{4}}$$

$$\gamma = \sqrt{\frac{5.8596}{4}}$$

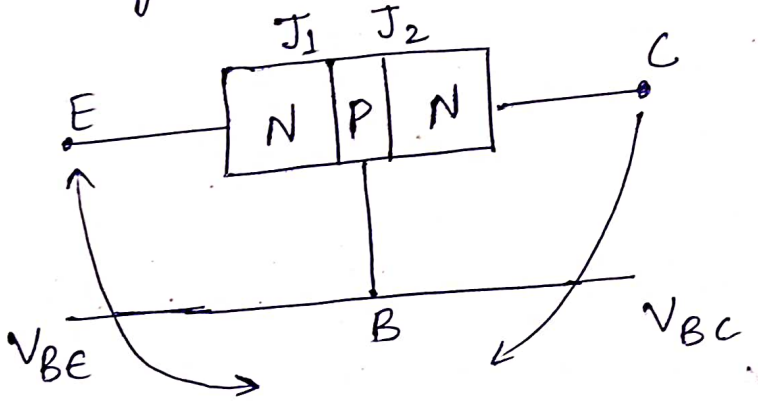
$$\gamma = \sqrt{1.46491} = 1.21$$

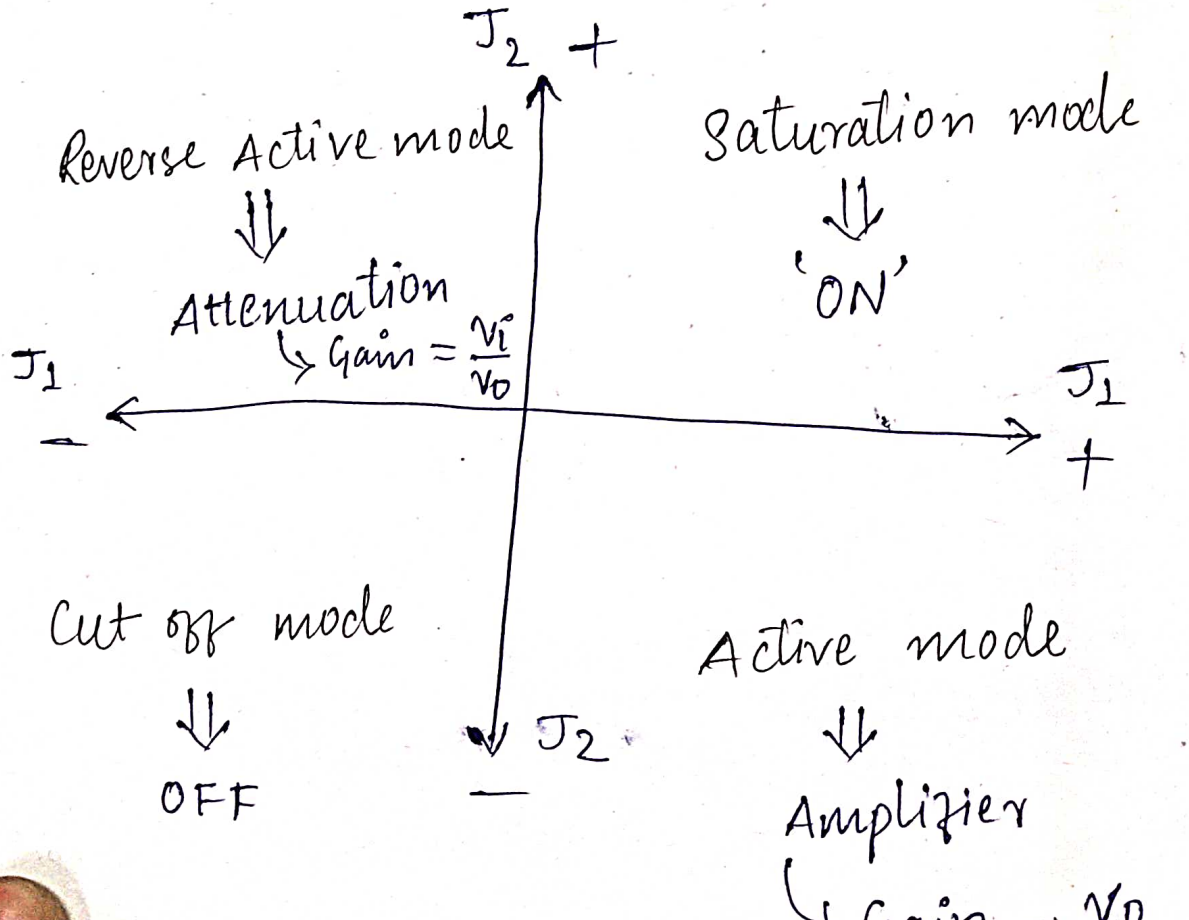
1 06/11/23

★ Three types of Transistor configuration

1. CEC ⟶ Amplifier
2. CBC ⟶ Impedance
3. CCC ⟶ RF circuit

★ operating mode of a transistor





* Characteristics of transistor

Basically, in a transistor three types of characteristics have to studied namely,

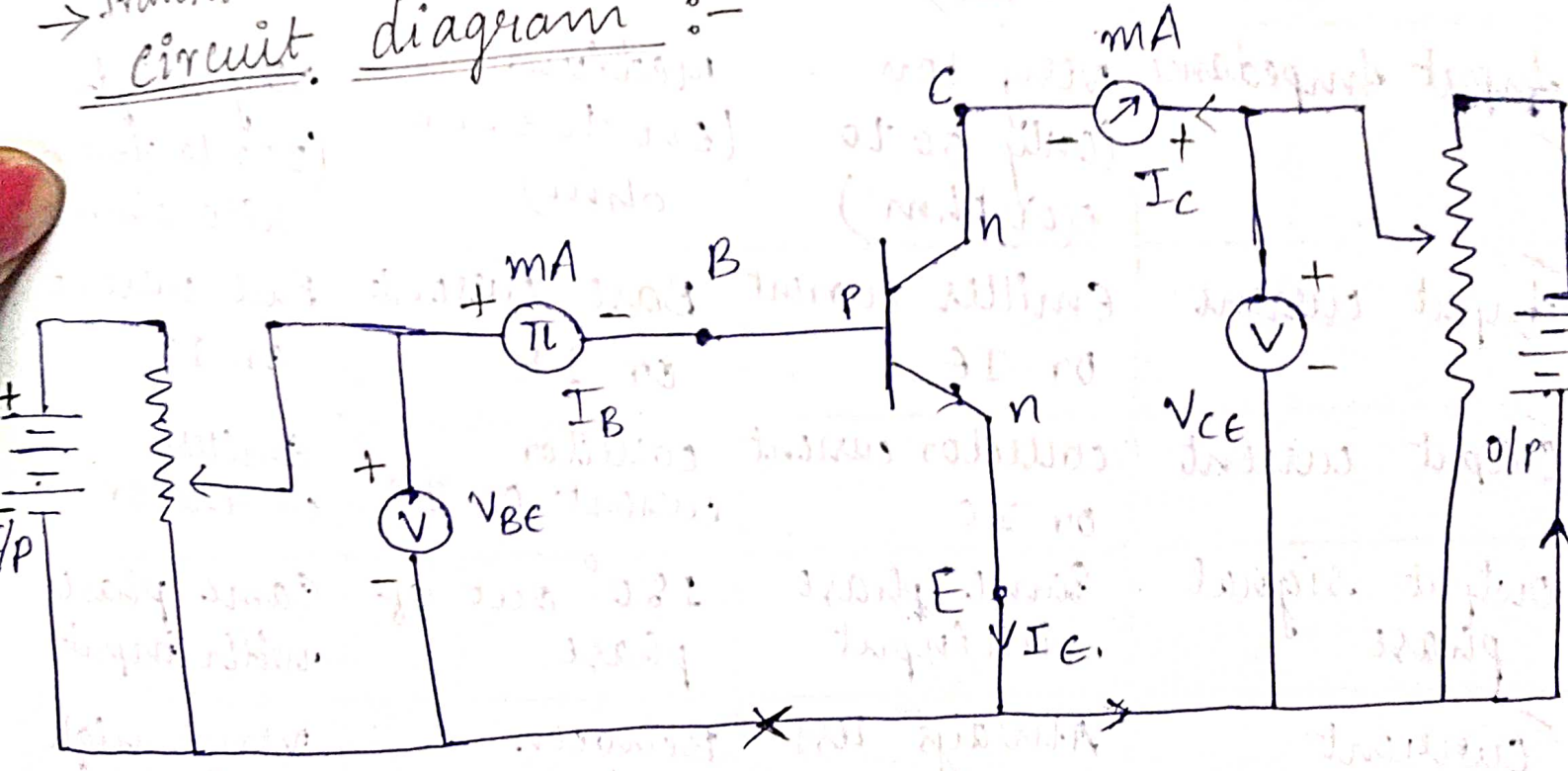
1. Input characteristics
2. Output characteristics
3. Transfer characteristics / Mutual characteristics

* characteristics transistor in com. characteristics in common emitter configuration [CEC]

1. Input characteristics → V_{BE} Vs I_B | V_{CE} = const.
2. Output → V_{CE} Vs I_C | V_{BE} = const.
3. Transfer → I_B Vs I_C | V_{CE}

→ Transistor is current control device : FET (or) voltage control device

Circuit diagram :-



$$I_E = I_B + I_C$$

1 Assignment

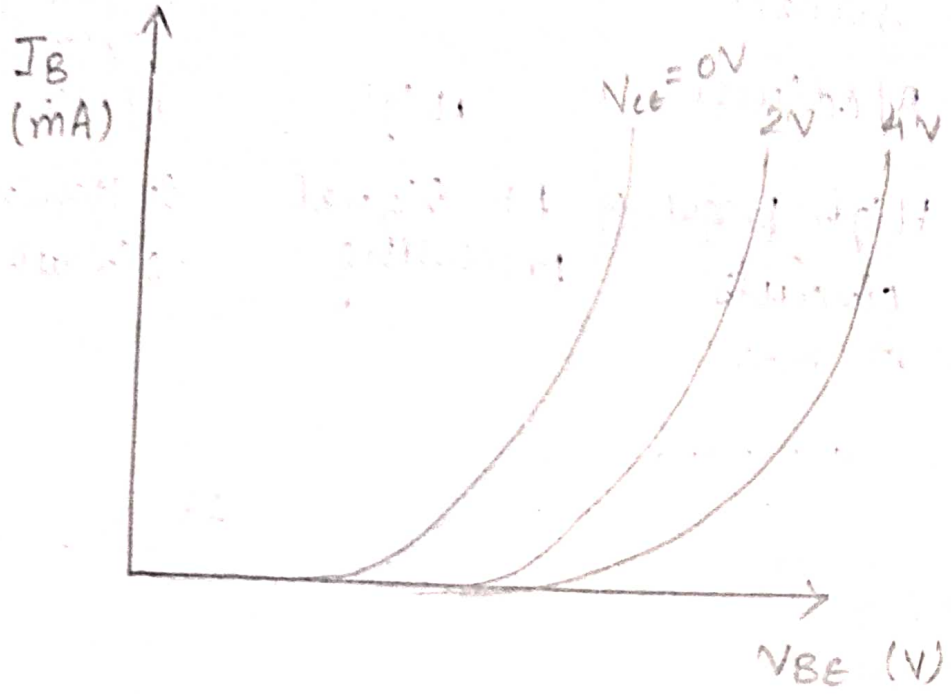
★ compare amount. CBC, CEC and CCC in detail.

Characteristics	CBC	CEC	CCC
Common terminal for input and output.	Base terminal	Emitter terminal	collector terminal
Input voltage applied between	Emitter and Base terminal	Base and Emitter terminal	Base and collector terminal
Output voltage taken across	collector and Base terminal	collector and Emitter terminal	Emitter and collector terminal
Output impedance	very high (1 to 10 mega ohm)	Medium (50 to 500 kilo ohm)	very low (up to 50 ohm)
Input impedance	very low (only 50 to 500 ohm)	Medium (500 to 5000 ohm)	very high (200 to 450 kilo ohm)
Input current	Emitter current or I_E	Base current or I_B	Base current or I_B
Output current	collector current or I_C	collector current or I_C	Emitter current or I_E
output signal phase	Same phase with input	180° out of phase	Same phase with input
Current Gain	Always less than unity $\alpha = \frac{I_C}{I_E}$	Between 35 to 500 $\beta = \frac{I_C}{I_B}$	very high $\gamma = \frac{I_E}{I_B}$

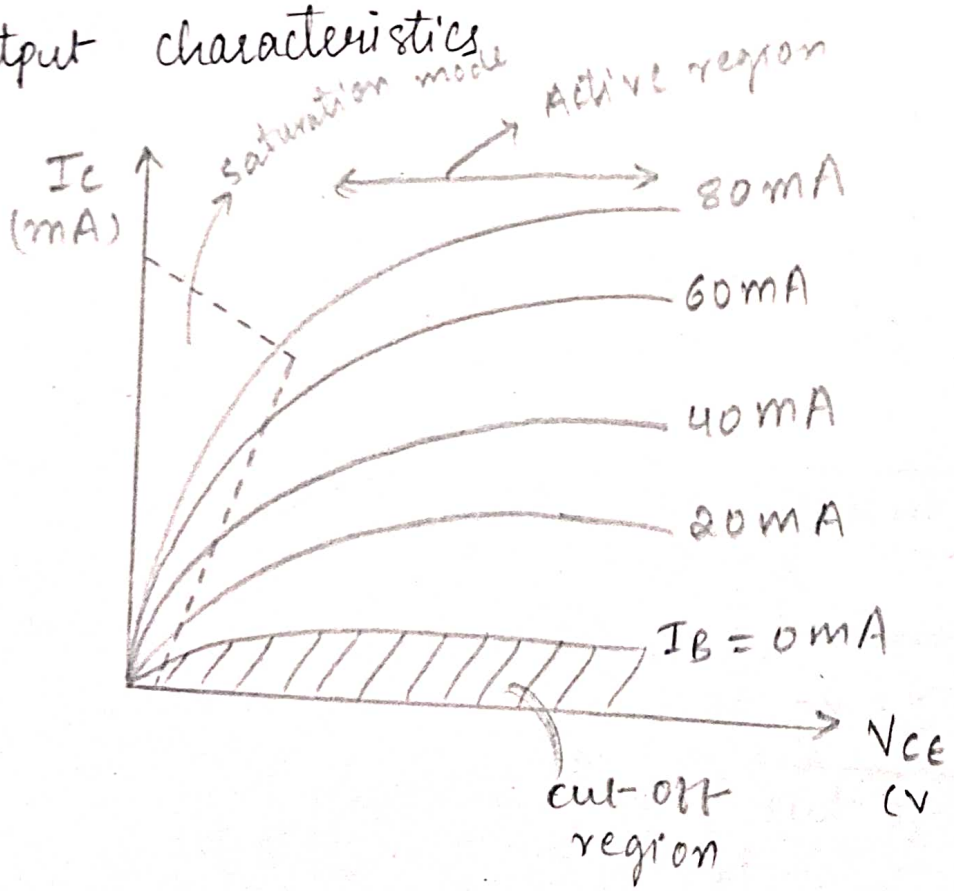
voltage Gain	About- 150	About- 500	less than unity
leakage current	very small	very large	very large
power Gain	Medium	High	Medium
Application	High frequency circuits	RF Signal processing	Switching circuits

08/11/23.

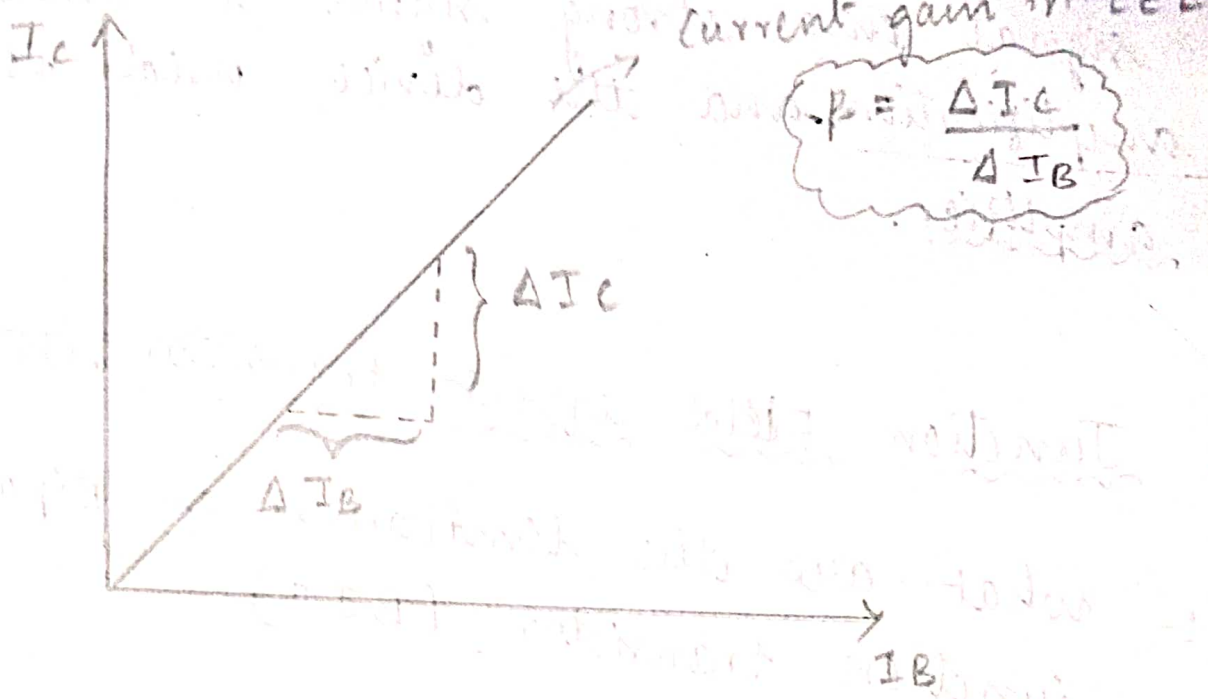
1. Input characteristics



2. Output characteristics



3. Transfer characteristics



current gain in CEC

$$\beta = \frac{\Delta I_C}{\Delta I_B}$$

Home work

1) Explain the transistor characteristics in CBC and CCC.

2) what is gain of transistor ? Reduce the relation among α, β and γ.

α	CBC	$\frac{\Delta I_C}{\Delta I_E}$	$\alpha < 1$
β	CEC	$\frac{\Delta I_C}{\Delta I_B}$	$\beta > 20-500$
γ	CCC	$\frac{\Delta I_E}{\Delta I_B}$	$\gamma \approx 1$

3) How transistor act as a amplifier, explain with proper circuit and example ?

Amplifier :- the process of increasing with weak signal into strong signal is known as amplification and the device used is called amplifier.

* Junction Field effect transistor : (JFET)

Que :- what are the limitation of Bipolar junction transistor (BJT).