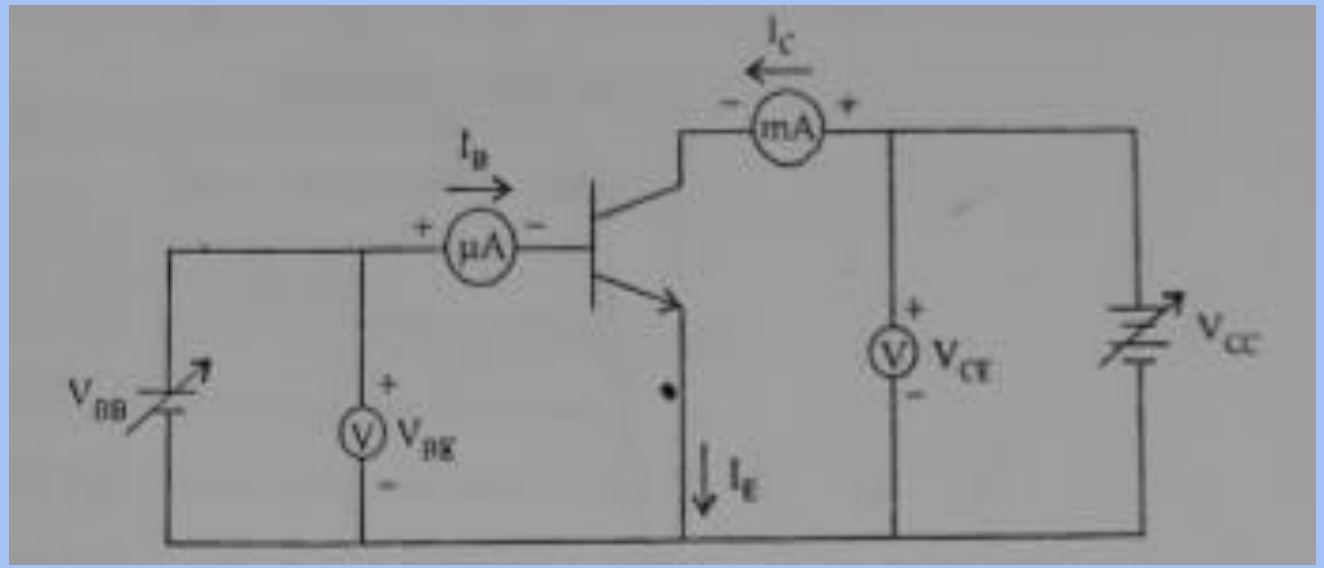
SUBJECT: BASIC ELECTRONICS

Common Emitter Configuration of Transistor Input/Output Characteristics

Elementrix Classes

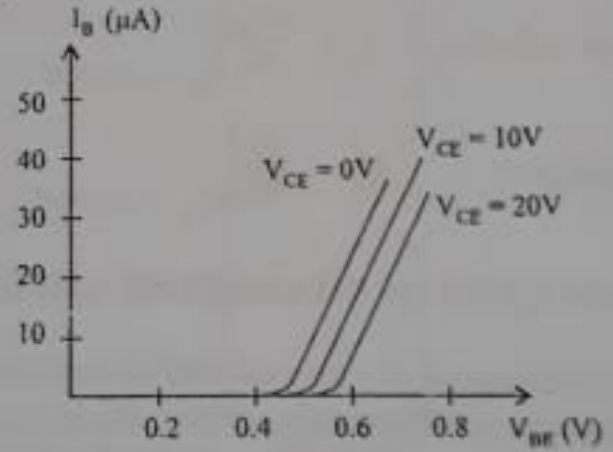
Common Emitter Configuration Characteristics



Input Characteristics

Input characteristics

It is the graph of input current I_B versus input voltage V_{BE} at a constant output voltage V_{CE}. It resembles the characteristics of forward biased diode. Input current I_B increases as input voltage V_{BE} increases for fixed value of V_{CE}.



As reverse bias voltage V_{CE} increases, depletion region in collector base increases. Hence the width of base available for conduction decreases. Hence I_B decreases due to early effect and graph shift towards X-axis.

Dynamic input resistance $r_i = \left.\frac{\Delta V_{BE}}{\Delta I_B}\right|_{V_{CE} = \text{constant}}$

Output Characteristics

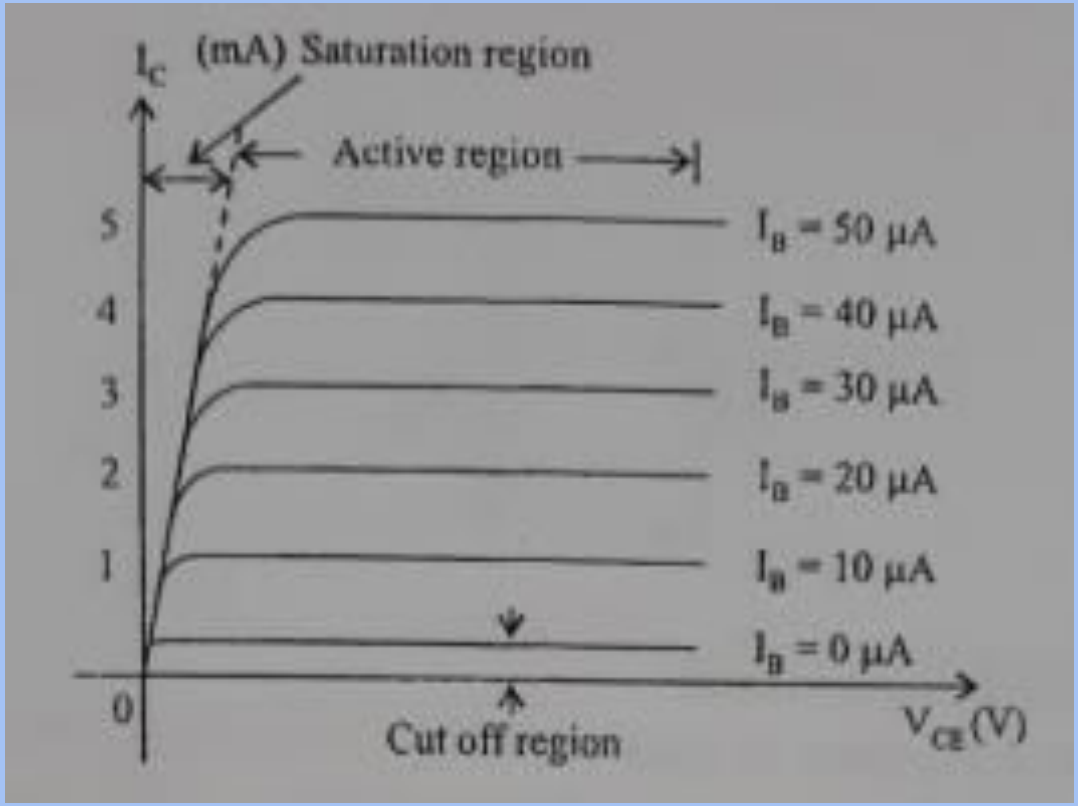
Output characteristics

It is the graph of output current I_C versus output voltage V_{CE} for given values of I_B. The output characteristics has three different regions :

(i) Cut-off region : In this region, both the junctions are reverse biased. When emitter base junction is reverse biased, the current due to majority carrier i.e. I_B is zero. Since collector-base junction is reverse biased, the current due to minority carriers flows from collector to emitter which is represented as I_{CEO}.

(ii) Active region : In this region, emitter base junction is forward biased and collector-base junction is reverse biased. As I_B is maintained constant, current I_C increases as reverse bias voltage V_{CE} increases.

(iii) Saturation region : In this region, both the junctions are forward biased. When V_{CE} is reduced to a small value such as 0.2 V, collector base junction is actually forward biased ($V_{CB} = V_{CE} - V_{BE} = 0.2 - 0.7 = -0.5$ V). In this region, there is large change in collector current I_C with small change in V_{CE}.


I_C (mA)
Saturation region
Active region
5
4
3
2
1
0
I_B = 50 μA
I_B = 40 μA
I_B = 30 μA
I_B = 20 μA
I_B = 10 μA
I_B = 0 μA
Cut off region
V_{CE}(V)

Output resistance $$r_o = \left.\frac{\Delta V_{CE}}{\Delta I_C}\right|_{I_B = \text{constant}}$$

Current gain $$\beta_{ac} = \left.\frac{\Delta I_C}{\Delta I_B}\right|_{V_{CE} = \text{constant}}$$

पढ़िए और पढ़ाइये

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