

Experiment No. - 06Common Emitter (CE)Object :-

To study the output characteristics of a given N-P-N transistor in common emitter mode and determine its current gain and output resistance (collector resistance).

Apparatus required :-

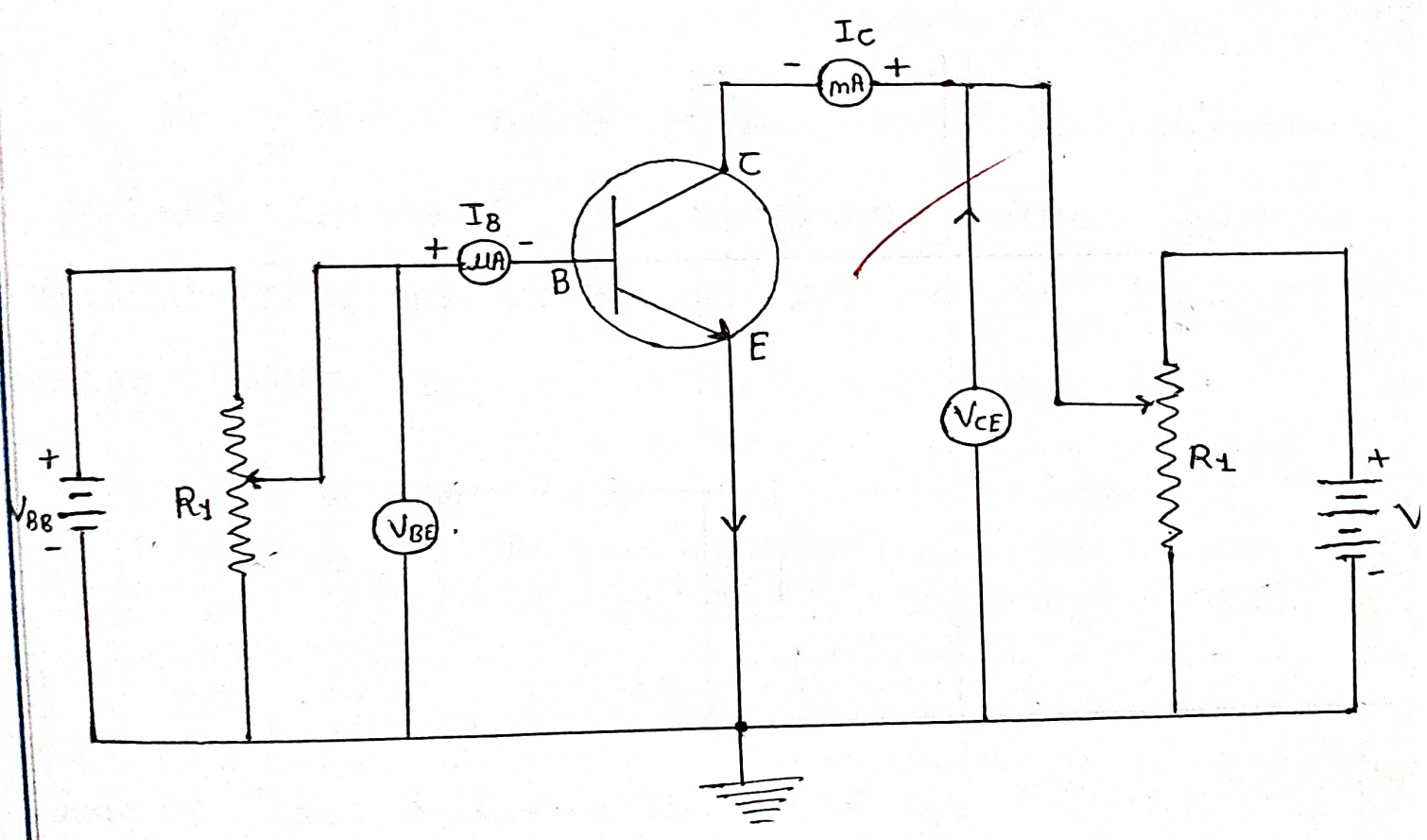
NPN transistor kit,  
milliammeter, micrometer voltmeter, power supply and connection wires.

Formula used :-

$$\beta = \left( \frac{\Delta I_c}{\Delta I_B} \right)_{V_{CE}} \times 10^3$$

Common Emitter Test circuit :-

The static characteristics of a transistor connected in CE configuration may be determined by the use of circuit diagram shown in fig. A micro-ammeter



Circuit :- NPN Transistor in CE mode

potentiometer  $R_2$  connected across dc supply  $V_{BB}$  is used to vary  $I_B$  and  $V_{BE}$ . A second voltmeter with a typical range of 0-20V is connected across collector - emitter terminals to measure the output collector - emitter voltage  $V_{CE}$ .

### Current transfer characteristic :-

It indicates how  $I_C$  varies with changes in  $I_B$  when  $V_{CE}$  is held constant at a given value. Such a typical characteristic is shown in fig. its slope gives

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

From fig. it is seen that a small collector current flows even when  $I_B = 0$ . It is the common - emitter leakage current  $I_{CE0} = (1 + \beta)I_{C0}$ . Like  $I_{C0}$ ,

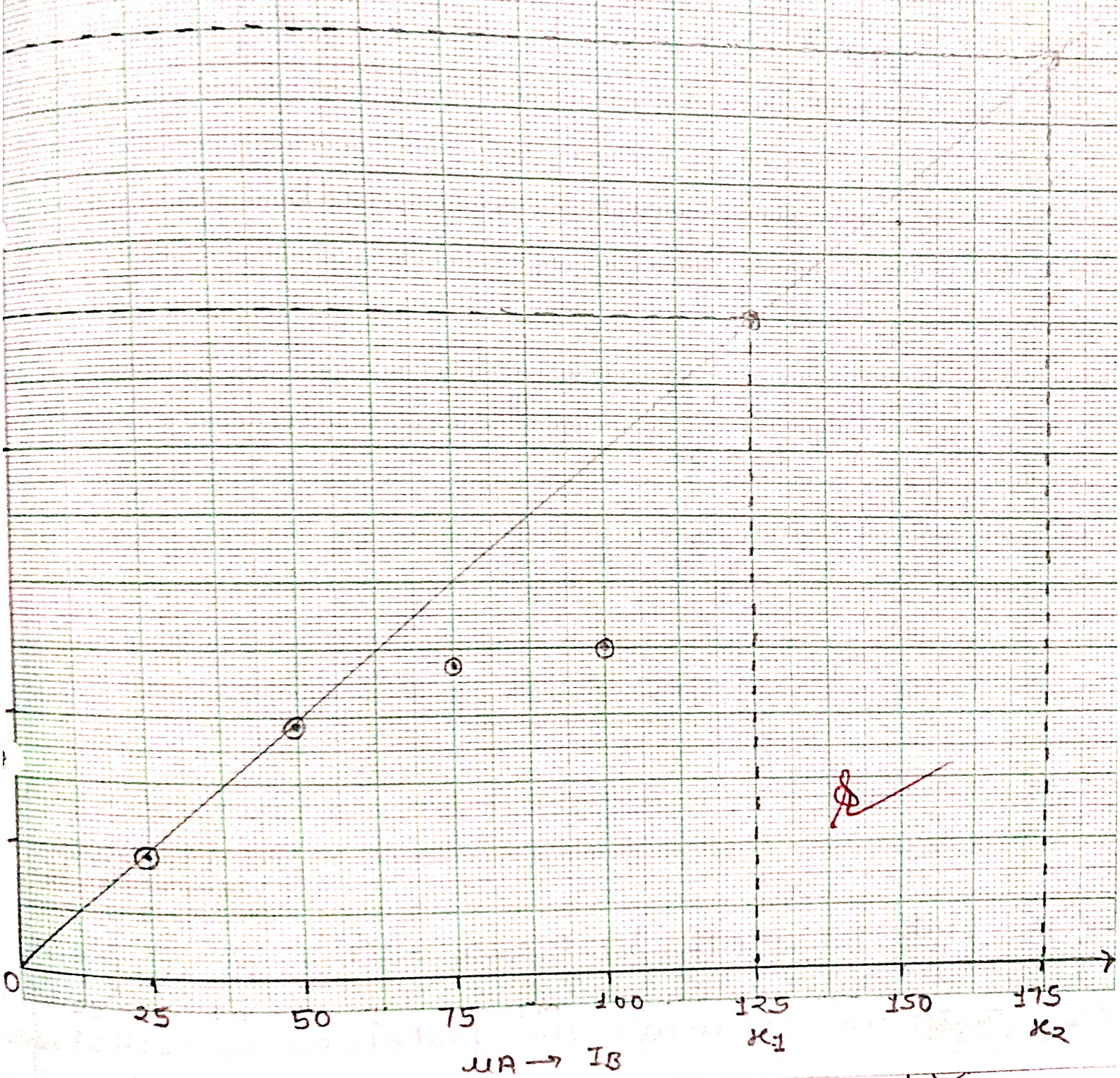
It is also due to the flow of minority carriers across the reverse-biased c/B junction.

Observation Table :-

S.N.	Input Base current $I_B$ in $\mu A$	Output collector current $I_C$ mA
1.	0	0
2.	25	3.5
3.	50	7.5
4.	75	9.5
5.	100	10
6.	125	20
7.	150	25
8.	175	28
9.	200	32

### Scale

on X axis so small that  
on Y axis so small that



Calculation :-

$$\Delta I_c = I_{c2} - I_{c1} \quad \text{and} \quad \Delta I_B = I_{B2} - I_{B1}$$

$$\Delta I_c = 28 - 20 \quad \Delta I_B = 175 - 125$$

$\Delta I_c = 8$

$\Delta I_B = 50$

then,

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

$\beta = \frac{8 \text{ mA}}{50 \times 10^{-3}}$

$\beta = \frac{800}{5}$

$\beta = 160$

Result :-

The current gain of this given NPN transistor in common emitter configuration  $\beta = 160$ .

Deen / checked  
6/11/2023