Exp.7: Transistor circuits

Part 1: Transistor input characteristic

1-*Objectives:*

- To measure the base current (I_B) as function of base-to-emitter voltage (V_{BE}), keeping emitter-to-collector voltage (V_{CE}) be constant.

2-*Circuit elements:*

- Power supply unit
- Fixed Resistor 1 kΩ
- Potentiometer 1 kΩ
- Transistor BD130, NPN,
- Ammeter
- Set of connecting leads

3-*Circuit Diagram :*

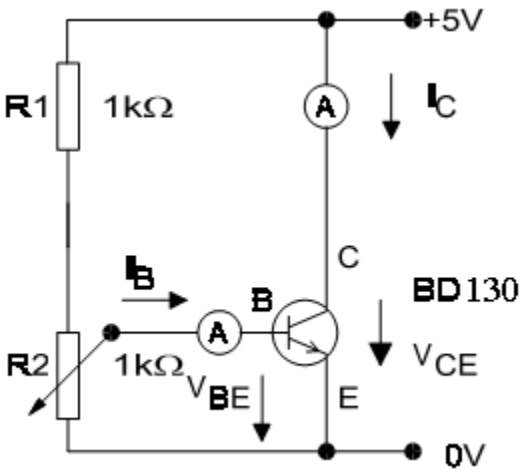


Fig. 1

4-***Procedure:***

- Connect the circuit as shown in the figure 1.
- Change the voltage V_{BE} by means of potentiometer and record the base current I_B values.
- Plot a graph between V_{BE} and I_B.
- Calculate the ratio of input voltage to input current for three different base currents from Tab. 1.
- a) I_B = 0.4 mA → R= **Ω**
- b) I_B = 1.3 mA → R = **Ω**
- c) I_B = 13 mA → R= **Ω**
- Choose the operating point Q=(I_B ,V_{BE}), in the rise up region.Calculate the dynamic base resistance

(Draw tangents to the operating points)

V_{BE}(volt)	0	0.1	0.3	0.5	0.6	0.65	0.7	0.75	0.8
I_B(mA)									

Table 1

Part 2: Control characteristic with current amplification

1-*Objectives:*

- To measure how the collector current (I_C) changes with base current (I_B) when the collector-to- emitter voltage (V_{CE}) is kept constant.
- To determine the current gain factor (β) of a common emitter configuration circuit.

2-*Circuit elements:*

- Power supply unit
- Fixed Resistor 1 kΩ
- Potentiometer 1 kΩ
- Transistor BD130, NPN,
- Ammeter
- Set of connecting leads

3-***Circuit Diagram***

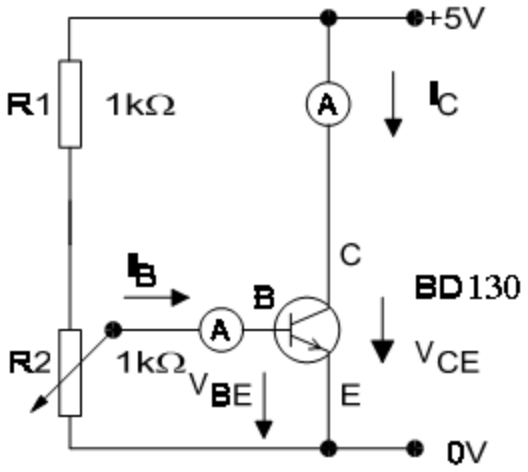


Fig. 2

4-***Procedure:***

- Connect the circuit as shown in the figure 2.
- Change the base current I_B by means of the potentiometer and record the collector current I_C .
- Determine the value (β) for common emitter configuration.
- Plot a graph between I_B and I_C.

$\frac{I_B}{mA}$	$\frac{I_C}{mA}$	B
0.01		
0.02		
0.05		
0.08		
0.10		
0.20		
0.30		
0.50		

Part 3: Transistor output characteristic

1-*Objectives:*

-Measurement methods for determining the relation between V_{CE} and I_C

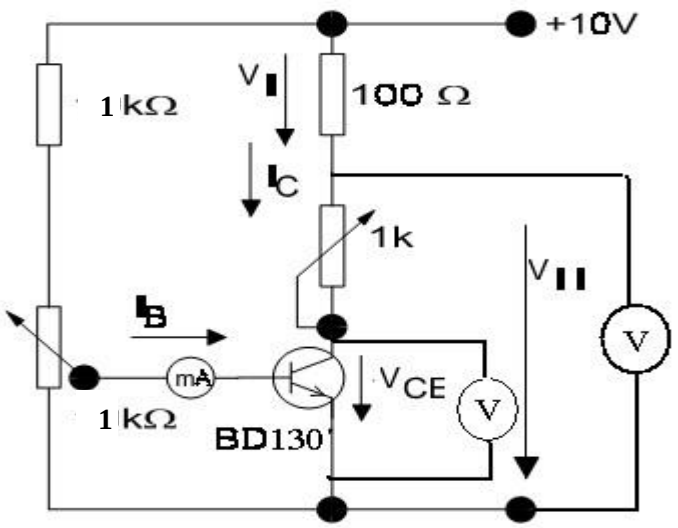
-Recording parameters in tables

-Representing the parameters in the output characteristic field

2-*Circuit elements:*

- Power supply unit
- Resistor 100 Ω
- Resistor 1 kΩ
- Potentiometer 1 kΩ
- Potentiometer 1 kΩ
- Transistor BD130
- 2 Multimeter
- Set of connecting leads

3-*Circuit Diagram*



4-***Procedure:***

1) Connect the circuit as shown in the circuit diagram.
2) Set the voltages V_{CE} given in Tab. 1 using the collector potentiometer (1 kΩ),
3) Measure the corresponding value VII
4) Calculate VI in each case (VI = 10V - VII)
5) Calculate the corresponding collector currents I_C (I_C = VI / R ; R= 100Ω)
6) Repeat the procedure for the base currents 200 µA, 300 µA, 400 µA, and 500 µA.

V_{CE} [V]	I_B = 100 µA		I_B = 200 µA		IB = 300 µA		IB = 400 µA		IB = 500	
	VI [V]	IC [mA]	VI [V]	IC [mA]	VI [V]	IC [mA]	VI [V]	IC [mA]	VI [V]	IC [mA]
0.2										
0.5										
1.0										
2.0										
4.0										
6.0										
8.0										

Tab. 2

7) Draw the characteristics from the values recorded in Tables 2.