NNAMDI AZIKIWE UNIVERSITY

FACULTY OF ENGINEERING

MECHANICAL ENGINEERING

FEG 201 APPLIED ELECTRICITY

TOPIC: COMMON BASE CONFIGURATION OF BC1O7 NPN TRANSISTOR

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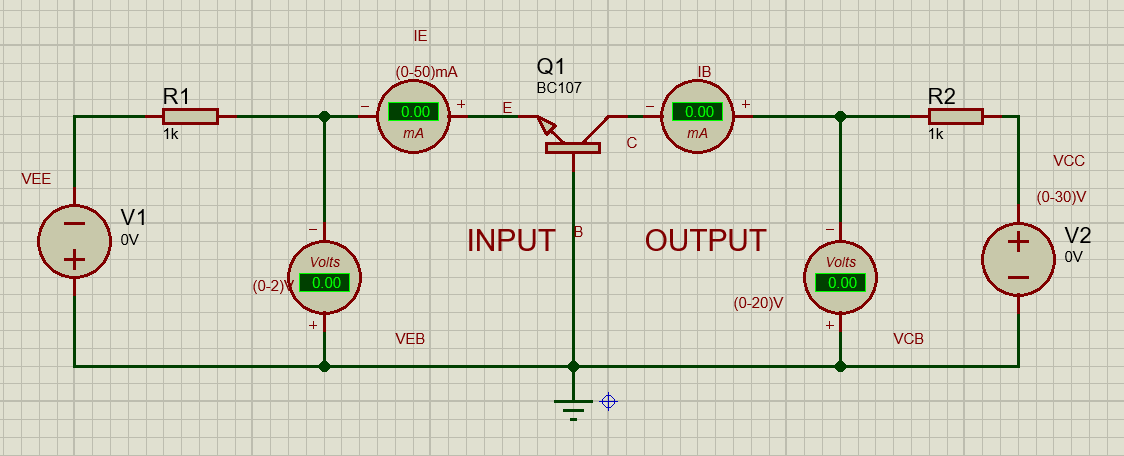
OBJECTIVES OF THE EXPERIMENT

* To plot the input and output characteristics of a transistor and to compute the H-parameters.

Apparatus:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Apparatus | Type | | Range | | Quantity |
| Transistor | BC107 | | \_\_\_\_\_ | | 1 |
| Resistor | \_\_\_\_\_ | | 1kΩ | | 2 |
| Regulated power supply | \_\_\_\_\_ | | 0 – 30V | | 2 |
| Ammeter | \_\_\_\_\_ | | 0 – 100mA | | 2 |
| Voltmeter | \_\_\_\_\_ | (0-2V)  (0-20V) | | | 1 |
| Bread board | \_\_\_\_\_ | \_\_\_\_\_ | | 1 | |
| Wire | \_\_\_\_\_ | \_\_\_\_\_ | | 1 | |

Circuit Diagram:



Procedures:

Input Characteristics:

* Connect the transistor in common base configuration as per the circuit diagram.
* Keep the output Voltage VCB = 0V by varying VCC
* By varying VEE, vary VEB in steps of 0.1 V and note down the emitter current, IE, reading
* Repeat the above procedure (step 3) for various values of VCB (VCB = 5V and VCB = 10V)
* Tabulate your result from above variation
* Plot the input characteristics model graph.

Table of Values for Input Characteristics:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| INPUT CHARACTERISTICS | | | | | | | | |
| VCB | | | VCB | | | VCB | | |
| 0V | | | 5V | | | 10V | | |
| VEE (V) | VEB (V) | IE (mA) | VEE (V) | VEB (V) | IE (mA) | VEE (V) | VEB (V) | IE (mA) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0.1 | 0.1 | 0 | 0.1 | 0.1 | 0 | 0.1 | 0.1 | 0 |
| 0.2 | 0.2 | 0 | 0.2 | 0.2 | 0 | 0.2 | 0.2 | 0 |
| 0.3 | 0.3 | 0 | 0.3 | 0.3 | 0 | 0.3 | 0.3 | 0 |
| 0.4 | 0.4 | 0 | 0.4 | 0.4 | 0 | 0.4 | 0.4 | 0 |
| 0.5 | 0.5 | 0 | 0.5 | 0.5 | 0 | 0.5 | 0.5 | 0 |
| 0.65 | 0.6 | 0.05 | 0.65 | 0.6 | 0.05 | 0.66 | 0.6 | 0.06 |
| 1.6 | 0.7 | 0.9 | 3 | 0.7 | 2.3 | 3.21 | 0.7 | 2.51 |
| 2.6 | 0.8 | 1.8 | 7.18 | 0.8 | 6.38 | 11.86 | 0.8 | 11.1 |
|  |  |  |  |  |  |  |  |  |

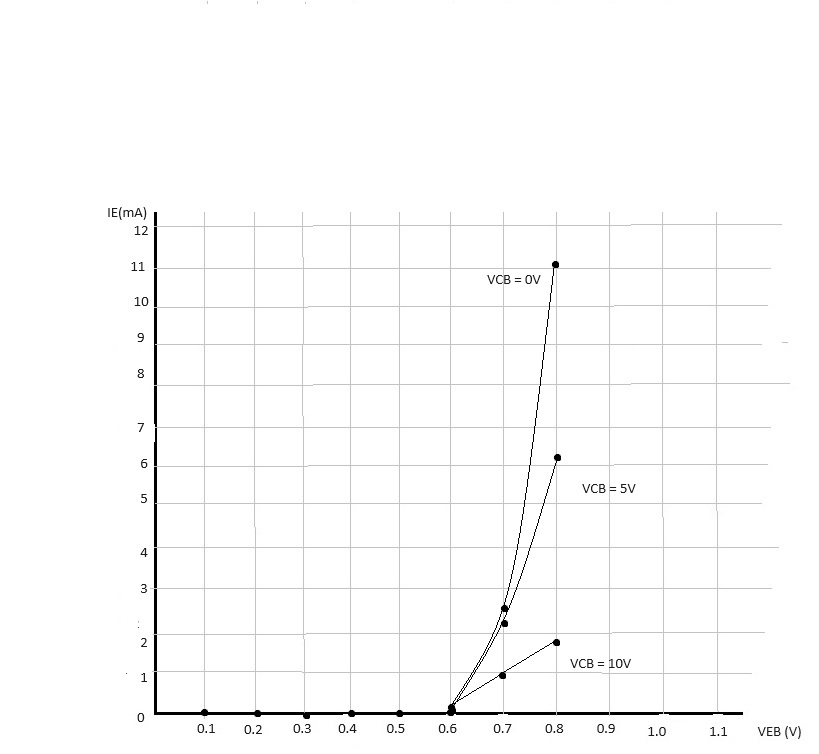


Fig 1: Input Characteristics Graph

CALCULATIONS:

1. Input Impedance

SLOPE= IE/VEB = (11.1-2.51) x 10^-3 / 0.87-0.7

= 0.0859

Input Impedance = 1/slope = 11.6 ohms

Output Characteristics:

* Make the connections as shown in the circuit diagram above
* By varying VEE, keep the base current, IB = 10mA
* By varying VCC, vary VCB in steps of 1V and note the readings of the collector current IC
* Repeat above procedures in step 3 for different values of IE (IE = 15mA and IE =20mA)
* Tabulate your readings from above variations
* Plot the output characteristics model graph

Table of Values for Output Characteristics:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IE | | | IE | | | IE | | |
| 10mA | | | 15mA | | | 20mA | | |
| VCC (V) | VCB (V) | IC (mA) | VCC (V) | VCB (V) | IC (mA) | VCC (V) | VCB (V) | IC (mA) |
| 0 | -1.41 | 1.41 | 0 | -1.77 | 1.77 | 0 | -2.14 | 2.14 |
| 9.86 | -0.41 | 10.3 | 10.4 | -0.77 | 11.2 | 10.39 | -1.14 | 11.5 |
| 11.3 | 0.59 | 10.7 | 16.19 | 0.23 | 16 | 20.39 | -0.14 | 20.5 |
| 12.3 | 1.59 | 10.7 | 17.19 | 1.23 | 16 | 22.17 | 0.86 | 21.3 |
| 13.3 | 2.59 | 10.7 | 18.19 | 2.23 | 16 | 23.17 | 1.86 | 21.3 |
| 14.3 | 3.59 | 10.7 | 19.19 | 3.23 | 16 | 24.18 | 2.86 | 21.3 |
| 15.3 | 4.59 | 10.7 | 20.2 | 4.23 | 16 | 25.18 | 3.86 | 21.3 |
| 16.3 | 5.59 | 10.7 | 21.2 | 5.23 | 16 | 26.18 | 4.86 | 21.3 |

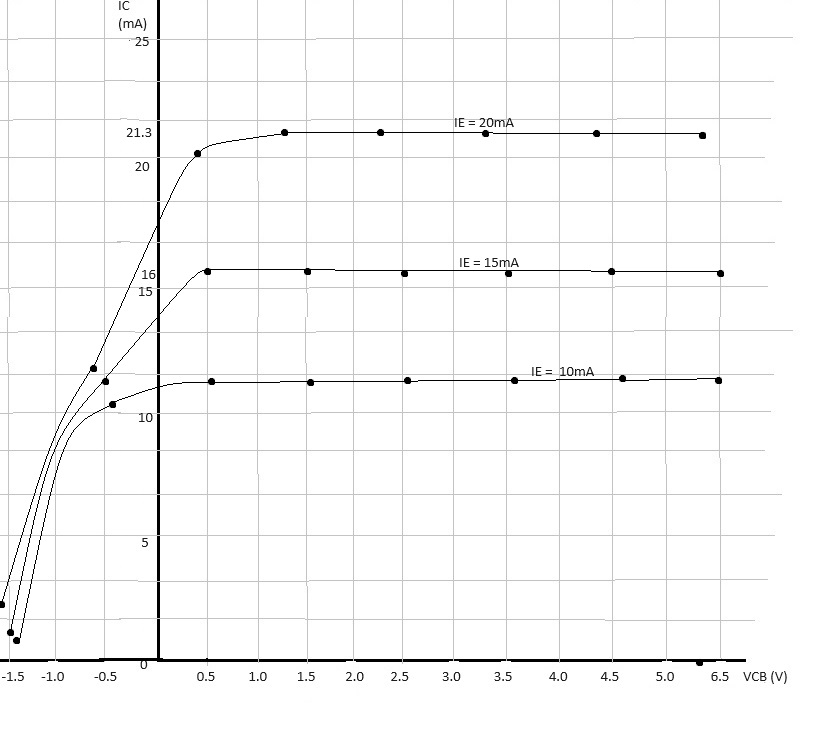


Fig 2: The Graph of Output Characteristics

CALCULATIONS:

1. Output Admittance (hob)

SLOPE = IC/VCB= (10.3 – 1.41)x 10^-3 /-0.41+1.41 = 0.00889 siemens

OUTPUT ADMITTANCE = SLOPE= 0.00889 siemens

Precautions:

* We took necessary precautions so as not to exceed the ratings of the transistor. This may lead to damage of the transistor.
* We made sure the voltmeter and ammeter are connected in correct polarities as shown in the circuit diagram.
* We cross-checked the circuit connections on the circuit diagram before switching on the voltage supply.
* We made sure we connected the transistor in the right manner following the circuit diagram.