|  |  |  |  |
| --- | --- | --- | --- |
| **Course Name:** | **EEEEL** | **Semester:** | **I/II** |
| **Date of Performance:** | **22/11/2024** | **Batch No:** | **C4-1** |
| **Student Name:** | **Dhruv Pankhania** | **Roll No:** | **16010124216** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/20** |

**Experiment No: 8**

**Title: BJT Common Emitter Characteristics**

|  |
| --- |
| **Aim and Objective of the Experiment:** |
| * To understand the structure and working of Bipolar Junction Transistor * To plot the Common Emitter characteristics of a BJT |

|  |
| --- |
| **COs to be achieved:** |
| **CO5:** Understand Bipolar Junction transistor and its applications. |

|  |
| --- |
| **Requirements:** |
| PC with internet facility |
| **Link for virtual lab:**  <https://be-iitkgp.vlabs.ac.in/exp/common-emitter-characteristics/> |

|  |
| --- |
| **Theory:** |
| Structure of Bipolar Junction Transistor  A bipolar junction transistor, BJT, is a single piece of silicon with two back-to-back P-N junctions. BJTs can be made either as PNP or as NPN. They have three regions and three terminals, emitter, base, and collector represented by E, B, and C respectively.  **Emitter (E):** It is the region to the left end which supply free charge carriers i.e., electrons in n-p-n or holes in p-n-p transistors. These majority carriers are injected to the middle region i.e. electrons in the p region of n-p-n or holes in the n region of p-n-p transistor. Emitter is a heavily doped region to supply a large number of majority carriers into the base.  Base (B): It is the middle region where either two p-type layers or two n-type layers are sandwiched. The majority carriers from the emitter region are injected into this region. This region is thin and very lightly doped.  **Collector (C):** It is the region to right end where charge carriers are collected. The area of this region is largest compared to emitter and base region. The doping level of this region is intermediate between heavily doped emitter region and lightly doped base region.  **Input Characteristics**  It is the plot of the base current, IB, versus the base-emitter voltage,VBE, for various values of the collector-emitter voltage,VCE for constant VCE  **Output Characteristics**  It is the plot of the collector current, IC, versus the collector-emitter voltage, VCE, for various values of the base current, IB |

|  |
| --- |
| **Circuit Diagram/ Block Diagram:** |
| BJT Common Emitter - Input Characteristics    BJT Common Emitter - Output Characteristics |

|  |
| --- |
| **Stepwise-Procedure:** |
| BJT Common Emitter - Input Characteristics   1. Initially set rheostat Rh1 = 1 Ω and rheostat Rh2 = 1 Ω 2. Set the Collector-Emitter Voltage(VCE) to 1 V by adjusting the rheostat Rh2 3. Base Emitter Voltage(VBE) is varied by adjusting the rheostat Rh1. 4. Note the reading of Base current(IB)in micro Ampere. 5. Click on 'Plot' to plot the I-V characteristics of Common-Emitter configuration. A graph is drawn with VBE along X-axis and IB along Y-axis. 6. Click on 'Clear' button to take another sets of readings 7. Now set the Collector-Emitter Voltage(VCE) to 2 V, 3 V, 4 V   **BJT Common Emitter - Output Characteristics**   1. Initially set rheostat Rh1 = 1 Ω and rheostat Rh2 = 1 Ω 2. Set the Base current(IB)15 uA by adjusting the rheostat Rh1 3. Vary the Collector-Emitter Voltage(VCE)is varied by adjusting the rheostat Rh2. 4. Note the reading of Collector current(IC). 5. Click on 'Plot' to plot the I-V characteristics of Common-Emitter configuration. A graph is drawn with VCE along X-axis and IC along Y-axis. 6. Click on 'Clear' button to take another sets of readings 7. Now set the Base Current(IB) to 20 uA |

|  |
| --- |
| **Observation Table:**  BJT Common Emitter - Input Characteristics |
| BJT Common Emitter - output Characteristics |
| **Post Lab Subjective/Objective type Questions:** |
| 1. Explain the structute of a BJT and the current relationships of the BJT CE amplifier   A Bipolar Junction Transistor is a three-layer semiconductor device with two p-n junctions, and it comes in two types: NPN and PNP.  NPN Transistor: Emitter (E): Heavily doped, emits majority carriers (electrons in NPN, holes in PNP). Base (B): Thin and lightly doped, allows minority carrier injection from the emitter to the collector. Collector (C): Moderately doped and larger in size to collect majority carriers from the emitter. PNP Transistor: Has similar regions but with opposite doping and charge carrier flow directions (holes instead of electrons). The CE amplifier configuration is widely used for voltage amplification, where the emitter is common to both the input (base-emitter) and output (collector-emitter) circuits. The CE amplifier inverts the input signal and is characterized by high voltage gain, medium input resistance, and low output resistance. |
|  |

|  |
| --- |
| **Conclusion:** |
| We understood the structure and working of Bipolar Junction Transistor and plotted the Common Emitter Input and Output characteristics of a BJT. Lastly we understood Bipolar Junction transistor and its applications. |

|  |
| --- |
| **Signature of faculty in-charge with Date:** |