

**Faculty of Engineering and Technology**

**Department of Electrical And Computer Engineering**

**Electronics Lab**

**(ENEE3112)**

**Experiment #3 (Prelab)**

**Transistor Biasing and The DC Parameters**

**Student’s name: Mohammed Fkheidah**

**Student’s ID: 1172294**

**Instructor: Dr. Mohammed Ju’beh
Assistant: Eng. Yazan Ismael**

**Date : 05/17/2022**

**Part A: The Transistor Biasing**



Figure 1 PNP transistor biasing circuit.

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **1.196 pA** | **-1.12 pA** | **-72.1 fA** |

**Part B : Reverse the connections of the power supply**

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
|  **Value** | **-648.9 uA** | **324.5 uA** | **324.3 uA** |

**Part C: Replace the PNP transistor with the NPN transistor**



Figure 2 NPN transistor biasing circuit.

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **662.3 uA** | **-331.3 uA** | **-331.1 uA** |

**Part D: Reverse the connections of the power supply**

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **-689 fA** | **659 fA** | **30 fA** |

**Part E: Transistor Biasing**

****

Figure 3 PNP transistor circuit.

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **-6.4 uA** | **1.42 mA** | **1.43 mA** |

**Part F: Reverse the connections of the power supply**

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **-314.2 uA** | **1.43 mA** | **-1.11 mA** |

**Part G: Replace the PNP transistor with the NPN transistor**



Figure 4 NPN transistor biasing circuit.

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **203.8 uA** | **-1.44 mA** | **1.23 mA** |

**Part H: Reverse the connections of the power supply**

|  |  |  |  |
| --- | --- | --- | --- |
| **current** | **Ib** | **Ic** | **Ie** |
| **Value** | **9.25 uA** | **1.43 mA** | **-1.44 mA** |

1. **The Transistor DC Parameters**

Figure 5 The Transistor DC Parameters circuit.

**Part A: Input Characteristic (hie)**

 **VBE for different VCE and IB values**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IB(uA)** | **0** | **5** | **10** | **15** |
| **VCE** |
| **0** | **0.68 pV** | **553.3 mV** | **571 mV** | **151 mV** |
| **0.2** | **20.1 m** | **636.96 mV** | **656.7 mV** | **667.1 mV** |
| **0.4** | **35.4 mV** | **647 mV** | **657.1 mV** | **669 mV** |

**Part B: Forward Current Transfer Characteristic (hfe)**

**IC for different VCE and IB values**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IB(uA)** | **0** | **5** | **10** | **15** |
| **VCE** |
| **2.5** | **3.78 pA** | **737.7 uA** | **1.6 mA** | **2.4 mA** |
| **5** | **8.46 pA** | **760 uA** | **1.69 mA** | **2.61 mA** |
| **15** | **33.1 pA** | **854 uA** | **1.86 mA** | **2.86 mA** |

**Part C: Reverse Voltage Characteristic (hre)**

**VBE for different VCE and IB values**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **VCE** | **0** | **0.5** | **2** | **5** | **15** |
| **IB(uA)** |
| **2.5** | **535.8 mV** | **617.1 mV** | **617.1 mV** | **617.1 mV** | **617.1 mV** |
| **5** | **553.9 mV** | **637.4 mV** | **637.4 mV** | **637.4 mV** | **637.4 mV** |
| **15** | **582.7 mV** | **668.8 mV** | **668.8 mV** | **668.8 mV** | **668.8 mV** |

**Part D: The output Characteristics (hoe)**

**IC for different VCE and IB values**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **VCE** | **0** | **0.5** | **2** | **5** | **15** |
| **IB(uA)** |
| **2.5** | **-2.23 uA** | **328.5 uA** | **335.1 uA** | **348.5 uA** | **395 uA** |
| **5** | **-4.47 uA** | **713.5 uA** | **729.8 uA** | **757.3 uA** | **853.6 uA** |
| **15** | **-14.2 uA** | **2.39 uA** | **2.44 uA** | **2.5 uA** | **2.9 uA** |