Experiment-3

BJT Biasing

Simulation Exercise

1. Design the following circuits having different DC biasing of BJT.

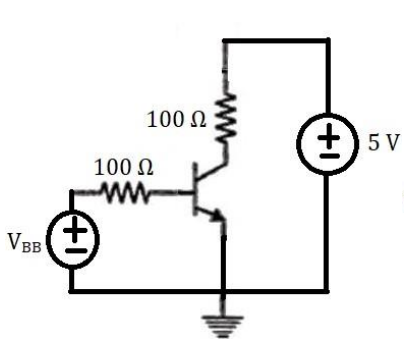
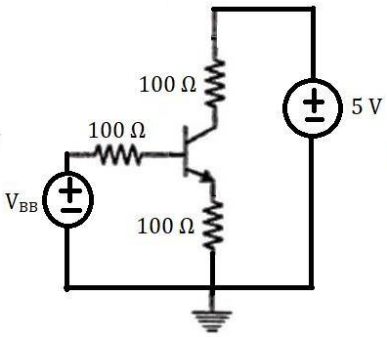
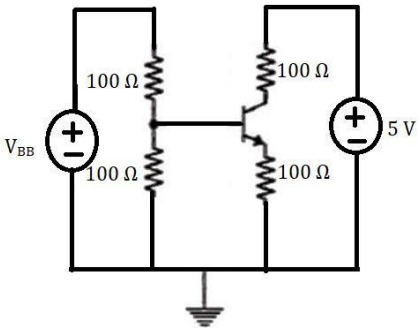


Figure 1(a): Fixed Bias



1(b): Self Bias



1(c): Potential-Divider Bias

2. Write the netlist for each of the circuit. Use the following spice model of 2N2222 BJT for simulations:

   .MODEL Q2N2222A NPN(IS=8.11E-14 BF=205 VAF=113 IKF=0.5 ISE=1.06E-11

   + NE=2 BR=4 VAR=24 IKR=0.225 RB=1.37 RE=0.343 RC=0.137 CJE=2.95E-11

   + TF=3.97E-10 CJC=1.52E-11 TR=8.5E-8 XTB=1.5)

3. Run the simulation by varying V_{BB}. Note down the values of V_{BE}, V_{CE}, I_C, and I_B

4. Find out the value of dI_c/dV_{BE} when the transistors are operating in active region for each of the bias-circuit.

5. Tabulate your observation as follows:

V_{BB}	Fixed Bias			Self-Bias			Potential-Divider Bias		
	V_{BE}	I_C	dI_C/dV_{BE}	V_{BE}	I_C	dI_C/dV_{BE}	V_{BE}	I_C	dI_C/dV_{BE}

Hardware Exercise Objectives:

1. To study the different types of DC Biasing for a BJT Common-Emitter Amplifier
2. To find the effect of the biasing schemes on stability factor (dI_C/dV_{BE})

Equipment/Components Required:

1. BJT – 2N2222
2. Resistors – 100 Ω
3. Regulated Power Supply
4. Variable Power Supply
5. Multimeters – 2Nos

Steps:

1. Wire up the circuit as shown in Figure 2 (a). Make sure that the BJT is operating in active region.

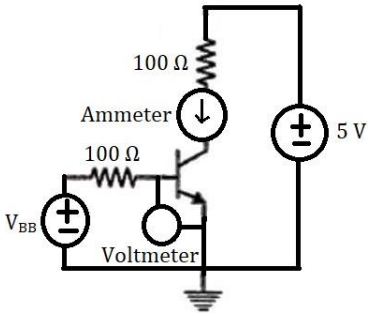
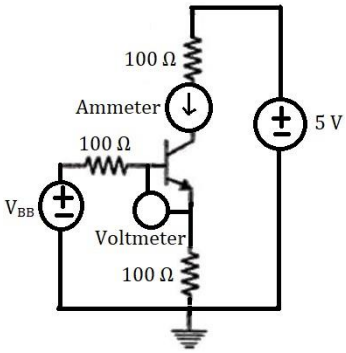
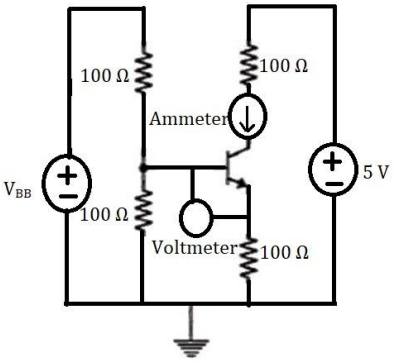


Figure 2(a): Fixed Bias



2(b): Self-Bias



2(c): Potential-Divider Bias

2. Vary the voltage V_{BB} in steps of 0.2 V. Make sure that the BJT keeps operating in active region.
3. Note down the values of V_{BE} (using the voltmeter) and I_C (using the ammeter) for different V_{BB}.
4. Repeat steps 2 and 3 for self-bias (Figure 2(b)) and potential-divider bias (Figure 2(c)) circuits.
5. Calculate the values of dI_C/dV_{BE} for all the three circuits.
6. Which circuit is better and why?