

Common Emitter Amplifier

Equipment

1. Function Generator
2. Oscilloscope
3. DC Power Supply
4. Multimeter

Materials

1. 2N3904 NPN Transistor
2. 33 kΩ Resistor R_1
3. 10 kΩ Resistor R_2
4. 1.5 kΩ Resistor R_C
5. 1 kΩ Resistor R_E
6. 10 μF Capacitor
7. 100 μF Capacitor

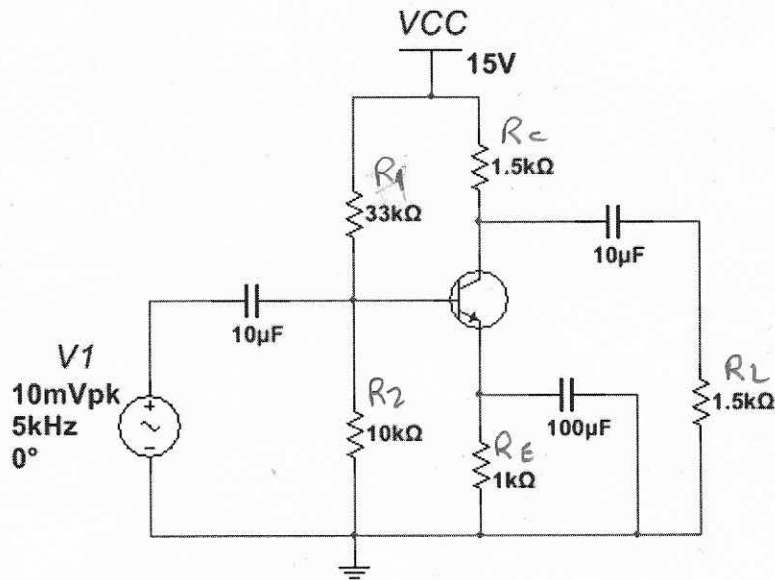


Figure 6-1

Procedure

1. Using the multimeter, measure the resistances of each resistor.

$R_1 =$ 32.6 kΩ $R_2 =$ 10.1 kΩ
 $R_E =$ 0.9 kΩ $R_C =$ 1.51 kΩ

2. On a breadboard, construct the dc circuit shown in *Figure 6-1* (for now omit the capacitors and load and ac source).

Measure I_B , I_{CQ} and V_{CEQ} of the dc circuit. Determine β .

$I_{BQ} =$ 0.013 mA $V_{CEQ} =$ 8.3 V
 $I_{CQ} =$ 2.65 mA $\beta = \frac{I_{CQ}}{I_{BQ}} = \frac{2.67}{0.013} = 205.3$

3. Setup the function generator to produce the circuit input signal and use the oscscope to view the input signal. Add the ac portion to the circuit (capacitors, ac signal and load).

4. Use **Channel 1** of the oscilloscope to measure V_{in} minimum voltage. Use **Channel 2** to measure the minimum output voltage, V_{out} . What is the measured voltage gain?

$A'_v =$ _____

$$V_{TH} = \frac{R_2}{R_1 + R_2} (V_{CC})$$

$$= \frac{10}{43} (15) = 3.48V$$

$$R_{TH} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{33 \times 10}{33 + 10}$$

$$= 7674$$

$$I_{CQ} = \frac{V_{TH} - 0.7}{\frac{R_{TH}}{\beta} + R_E}$$

$$= \frac{3.48 - 0.7}{\frac{7674}{160} + 1k} = 2.65mA$$

$$V_e = \frac{25}{2.65} = 9.43mV$$

5. Take a screenshot including measurements in the following order: (top) Frequency, Channel 1 Min, Channel 2 Min, Phase 1 →2.

Submittal: All sections must be completed digitally. (Not hand-written/drawn)

1. **Title Page** (Appropriate information is described in the 'Format of a Technical Report' found on Blackboard)
2. **OBJECTIVE** – This section is in paragraph form comprised of complete sentences stating the purposes for doing the experiment. (What theory was this experiment supposed to verify?)
3. **PROCEDURE** – This may be numbered steps, but do not copy the steps written in this handout.
4. **DATA** section including (but not necessarily limited to):
 - a. **Circuit**
 - b. **Calculations:** (use $\beta_{DC} = 160$)
 - c. **Screenshots (1)**
 - d. **Table 6-1:** This table should include measured and calculated values of all the pertinent parameters. (% error)
5. **DISCUSSION**
6. **CONCLUSION** This section is in paragraph form comprised of complete sentences stating whether or not the experiment was successful, how did the student know it was successful, and how successful it was (% error).

Hint: For a successful submittal, make sure your submittal components are presented in the above order. This makes organized and logical sense for an explanation of data. Be sure headings are stated (for example: **DATA**) as well as any sub-headings (like **CALCULATIONS**) and all components of the **DATA** section are labeled.