SIMULATION HOMEWORK 5: BJT AMPLIFIER

Objectives

The objective of this experiment is to obtain and learn gain characteristic of bjt amplifier circuits practically.

Components Required:

DC Voltage Source

AC Voltage Source

Oscilloscope

Multimeter

Transistör: BC237

Resistors: 220kΩ, 10kΩ, 8.2 kΩ, 33kΩ, 1.2kΩ, 18kΩ

Capacitor: 4.7µF (x2), 220 µF

Preliminary Work:

1. Set up the circuit given in Figure 1. Use Q2N3904 transistor model.

a. Analyze the circuit given in Figure 1 and find IB, IC, and VCE. (βDC = 300)
b. Simulate the same circuit in OrCAD. Label base, emitter, and collector terminals of the transistor as B, E, and C, respectively. Perform DC simulation and provide the screenshot of the results. (Use 'Bias Point' analysis. You can refer to the Figure 3 to understand how to display current and voltage values.)
c. Do your simulation results justify the answers in part (a)? (IB, IC, and VCE)

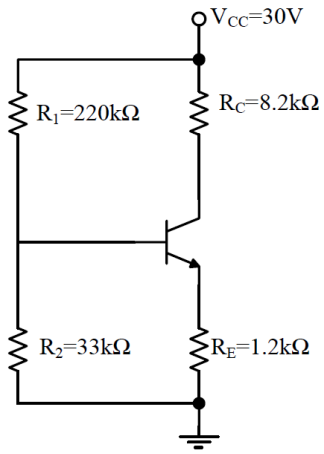

Figure 1

2. Set up the circuit given in Figure 2 in OrCAD. Use Q2N3904 transistor model.

a. Run AC simulation from 10 Hz to 1 GHz. Set type of sweep as “decade” with 10 point per decade. Plot the AC voltage gain (*vout* / *vin*). Label the midband frequency gain (in dB) and low and high corner frequencies (the 3-dB frequencies) in the plot before importing it to your homework. What is the midband voltage gain as a ratio (not in dB)?

b. Change the input signal with a sinusoidal voltage source that has 1mV amplitude at 100kHz. Run transient simulation for 50µs. Plot the input and output signals. What is the gain based on the transient simulation? Does it agree with the AC gain in part (a)?

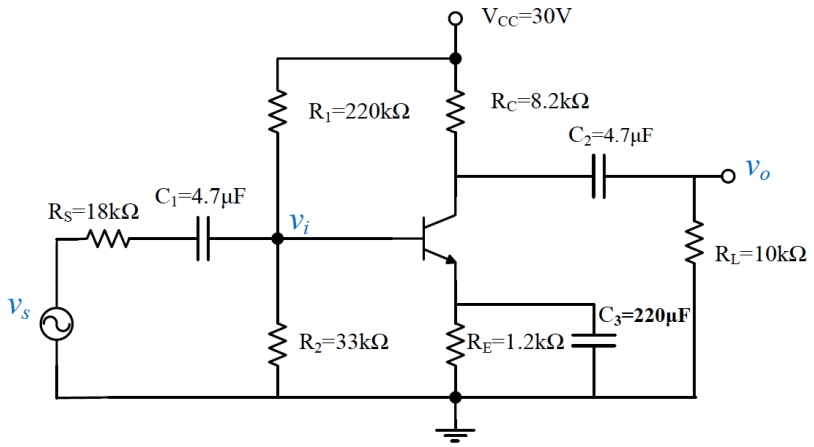

Figure 2

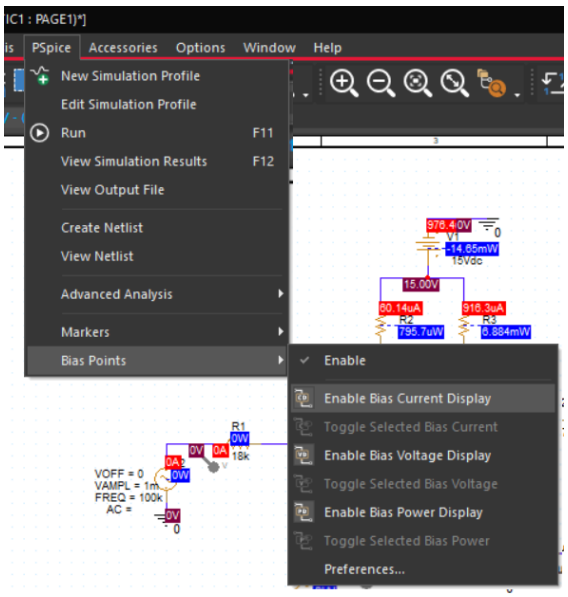

Figure 3