VE311 Electronic Circuits

Summer 2023 — Lab 2

Instructor: Dr. Xuyang Lu

Due: 11:59 pm, July 1, 2023 (Saturday)

Note:

1. Please use A4 size papers.
2. The lab report should be submitted online individually.
3. Use Proteus 8.10 for simulation before the lab session. In the Proteus library, you should be able to find all the components used in the schematics. The lab report must include both the simulation and measurement results.

Exercise 2.1

[Common-Emitter Amplifier] Build the voltage regulator below in Proteus and on the breadboard.

1. [40%] Design and build a common-emitter amplifier in Proteus and on the breadboard which has a voltage gain $A_v > 10$, using npn BJT 2N3904. Plot V_{OUT} vs V_{IN}. (Hint: First choose an appropriate R_C. Second, perform DC sweep to find out a V_{IN} at which the magnitude of slope is more than 10. At the same time, make sure the BJT is in the forward-active region. If not working, change for another $\mathrm{R_C}$ and repeat the DC sweep analysis again.)
2. [30%] For $V_{\mathrm{in}} = V_{\mathrm{IN}} + 0.01\sin(2\pi 10^2 \cdot \text{ time })$, plot $V_{\mathrm{out}} = V_{\mathrm{OUT}} + v_{\mathrm{out}}$ vs time. Confirm that the amplitude of v_{out} is equal to $0.01\times A_v$.
3. [30%] For $\mathrm{V_{in}} = \mathrm{V_{IN}} + 0.01\sin(2\pi 10^7 . \text{ time})$, plot $\mathrm{V_{out}} = \mathrm{V_{OUT}} + v_{\mathrm{out}}$ vs time. Is the amplitude of v_{out} still equal to $0.01 \times A_v$? If not, explain the possible reasons.