
VE311 Electronic Circuit HW3

Due: **Jun 11th 11:59 a.m.**

Note

1. Please use A4 size paper or page.
2. Please clearly state your final result for each question.
3. Please state and verify the operating region (cutoff, FAR/active, or saturation) of each BJT.

Problem 1

An npn transistor of a type whose β is specified to range from 50 to 300 is connected in a circuit with emitter grounded, collector at +10 V, and a current of $10\ \mu\text{A}$ injected into the base. Calculate the range of collector and emitter currents that can result. What is the maximum power dissipated in the transistor?

(Note: Perhaps you can see why this is a bad way to establish the operating current in the collector of a BJT.)

Problem 2

A very simple circuit for measuring β of an npn transistor is shown in Fig 1. In a particular design, V_{CC} is provided by a 9-V battery; M is a current meter with a $50\text{-}\mu\text{A}$ full scale and relatively low resistance that you can neglect for our purposes here. Assuming that the transistor has $V_{BE}=0.7\text{ V}$ at $I_E=1\text{mA}$, what value of R_C would establish a resistor current of 1 mA? Now, to what value of β does a meter reading of full scale correspond? What is β if the meter reading is 1/5 of full scale? 1/10 of full scale?

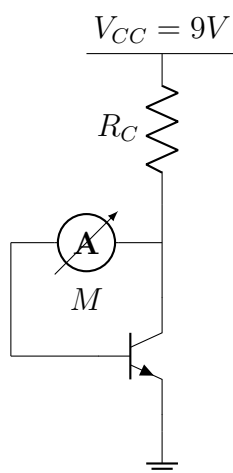


Figure 1: circuit for problem 2

Problem 3

For the circuit in Fig 2, find V_B and V_E for $v_I = 0V, +2V, -2.5V$, and $-5V$. The BJTs have $\beta=50$.

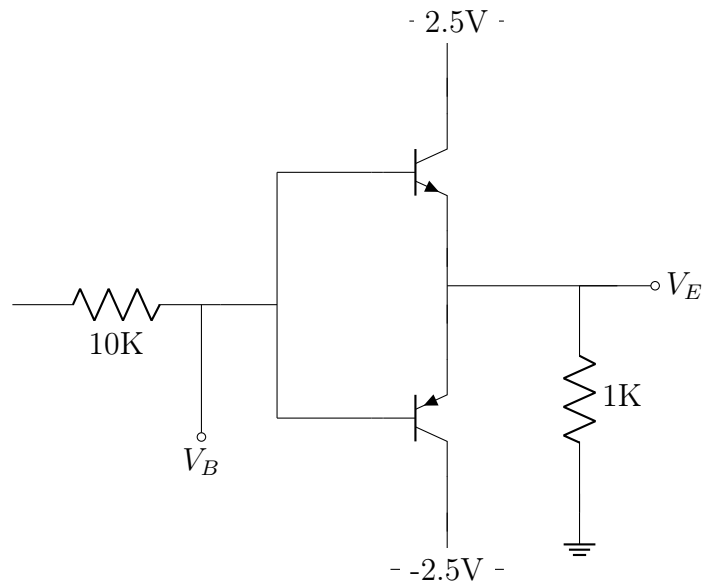


Figure 2: circuit for problem 3

Problem 4

For the circuit shown in Fig. 3, find the labeled node voltages for:

- (a) $\beta = \infty$;
- (b) $\beta = 100$;

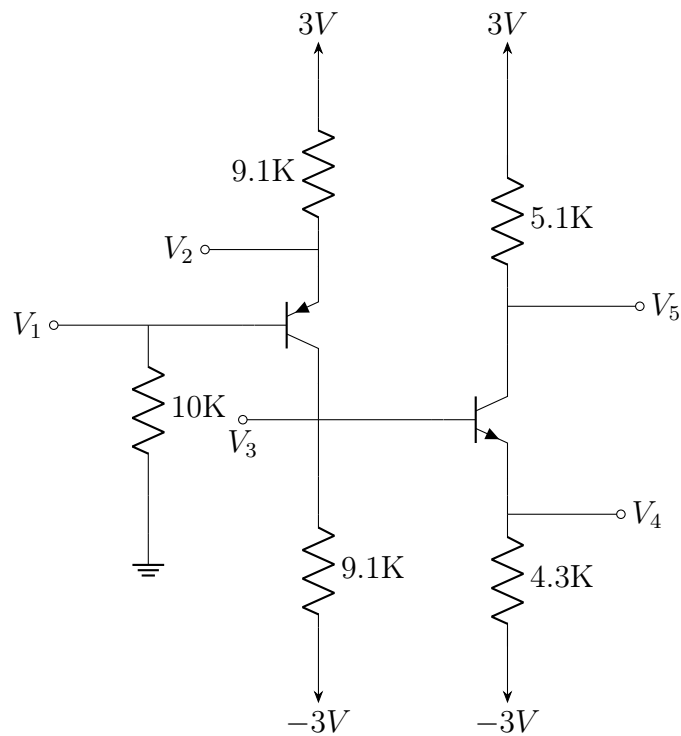


Figure 3: circuit for problem 4