

Name

PID

**UNIVERSITY OF CALIFORNIA, SAN DIEGO**

Electrical and Computer Engineering Department

ECE 65 – Fall 2019

*Components and Circuits lab*

Midterm Exam 2

Closed books, one one-sided cheat sheet, and calculators are allowed

Electronic devices are not allowed.

Please put all answers in the provided sheets.

Be sure to write your name and PID on **all pages**.

Please do not begin until told. **Show your work.** Good luck.

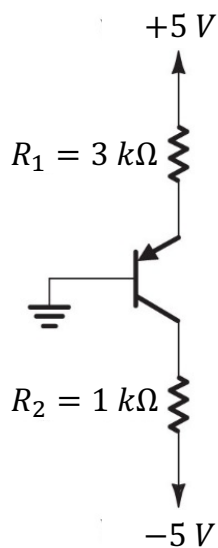
All electronic devices including cell phones must be turned off and stored away in a backpack or a purse. Anyone caught with such a device on their person during the exam will be charged with academic dishonesty.

**Problem 1.** (10 points)

In the following circuit,

- Find the collector current and the collector and emitter node voltages.
- Find the largest value to which  $R_2$  can be raised while the transistor remains in the active mode with the same collector current that you calculated in part a.

Assume  $V_{D0} = 0.7\text{ V}$ ,  $\beta = 100$ ,  $V_{sat} = 0.2\text{ V}$ . **Show your work.**



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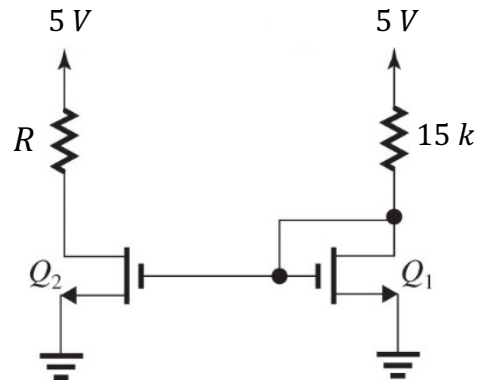
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**Problem 2.** (10 points)

In the following circuit, the two transistors are identical. Find the value of  $R$  that results in  $Q_2$  operating at the edge of saturation.

Assume  $\left(\mu_n C_{ox} \frac{W}{L}\right) = 4 \text{ mA/V}^2$ ,  $V_t = 1 \text{ V}$ ,  $\lambda = 0$ . **Show your work.**



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