ECE 3050 Analog Electronics Quiz 9
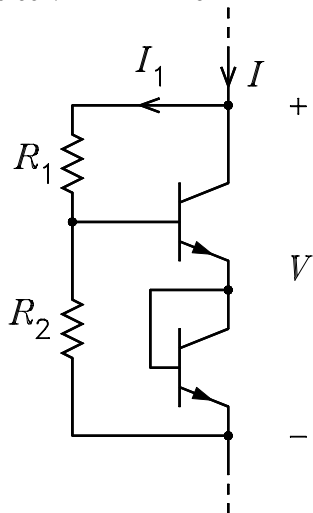March 11, 2009

Professor Leach   Name_____

Instructions. Print your name in the space above. **Honor Code:** *I have neither given nor received help on this quiz.* Initials _____

1. A V_{BE} multiplier circuit is shown. One of the BJT's is connected as a diode. If $\beta = \infty$ and $V_{BE} = 0.65\,\text{V}$ for each BJT and $I = 3\,\text{mA}$, solve for R_1 and R_2 for $V = 3.5\,\text{V}$ and $I_1 = 0.85I$.

$V_{BE} := 0.65$ $I := 0.003$ $V := 3.5$ $I_1 := 0.85 \cdot I$

$$R_1 := \frac{2 \cdot V_{BE}}{I_1} \qquad R_1 = 5.098 \cdot 10^2 \qquad R_2 := \frac{V - 2 \cdot V_{BE}}{I_1} \qquad R_2 = 8.627 \cdot 10^2$$

2. A current source is shown. For the JFET, $I_D = \beta_{FET}\left(V_{GS} - V_{TO}\right)^2$, where $\beta_{FET} = 0.3\,\text{mA}/\text{V}^2$ and $V_{TO} = -4\,\text{V}$. For the Zener diode, $V_Z = 4.7\,\text{V}$. For the BJT, $\beta_{BJT} = 99$ and $V_{BE} = 0.65\,\text{V}$.
   (a) Solve for the current through the Zener diode if $I_O = 2\,\text{mA}$..
   (b) Solve for the value of R_E for $I_O = 2\,\text{mA}$.
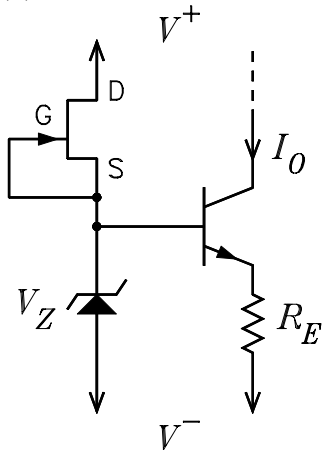
$$\beta_{FET} := 0.0003 \qquad V_{TO} := -4 \qquad V_Z := 4.7 \qquad \beta_{BJT} := 99 \qquad V_{BE} := 0.65 \qquad I_O := 0.002$$

$$\alpha_{BJT} := \frac{\beta_{BJT}}{1 + \beta_{BJT}} \qquad I_Z := \beta_{FET} \cdot V_{TO}^2 - \frac{I_O}{\beta_{BJT}} \qquad I_Z = 4.78 \cdot 10^{-3}$$

$$R_E := \frac{V_Z - V_{BE}}{\dfrac{I_O}{\alpha_{BJT}}} \qquad R_E = 2.005 \cdot 10^3$$