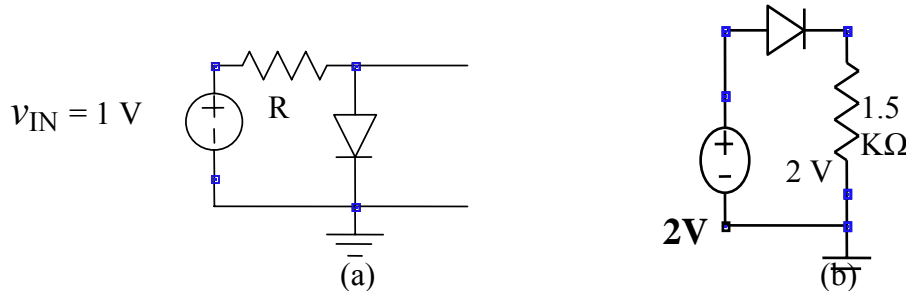


ECE255

Homework # 3

1.18 (a) Design the circuit for the current in the resistor to be 1.5 mA. If the diode has $I_S = 3$ nA and $n = 1.20$. Verify the design by analysis. (b) In the circuit shown, the diode has $I_S = 3$ pA and $n = 1.15$, calculate the operating point.



1.19 A diode is connected in series with a 1 K Ω resistor and a 6 V battery such that the diode is forward biased. Calculate the current through the resistor if the diode is modeled by the Piecewise Linear as (a) the perfect diode model (b) perfect diode plus resistor model where the resistor in the model is 10 Ω ; (c) perfect diode in series with $R_0 = 5$ Ω and $V_0 = 0.6$ V; (d) the ideal Shockley diode equation at 27°C where $I_S = 17$ nA and $n = 1.1$.

1.20 At 27°C diode D1 has $n_1 = 1.7$ and $I_{S1} = 13$ pA and diode D2 has $n_2 = 1.01$ and $I_{S2} = 65$ fA are used to model a real diode. Together, these two diodes placed in parallel provide a nonlinear model for diode D3. Use SPICE to make a semi-log plot ($\ln I_{D3}$ vs V_{D3}) of D3. Also on the same semi-log plot show I_{D1} and I_{D2} . Hand in the plot and the input (or output) with your name in the title line. Hint: V_D range from 0.01 to 1 in 0.002 increments works well.