Show all your work. Exam is to be completed on your own. Any exams that appear to be copies will each be given a 0.

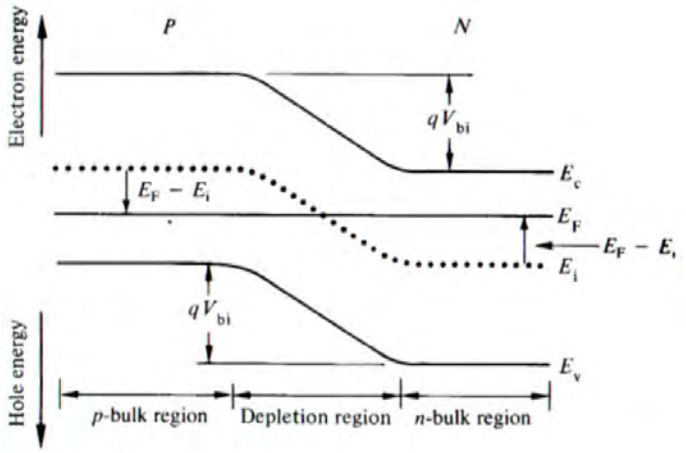
T/F (5 Points each)

1. [T] [F] A reduction in the depletion region width means that the diode has been reversed biased.

2. [T] [F] To forward bias a diode, a positive potential must be supplied to the n-type region of the diode.

Questions (18 Points each)

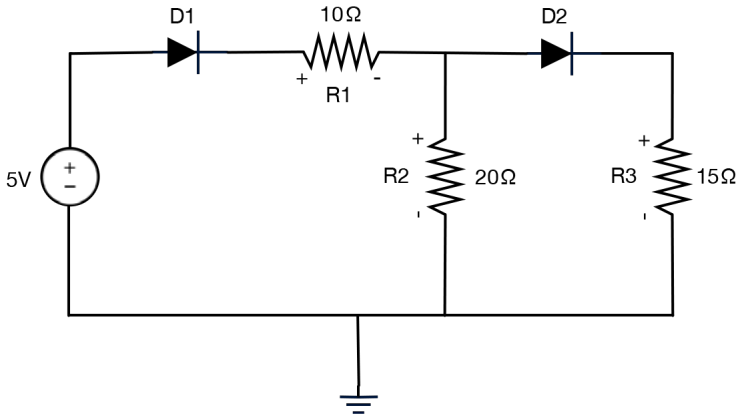
1. In the diagram below, E_F - E_i = $-0.4eV$ in the p-region and E_F - E_i = $0.3eV$ in the n-region of the diode. Assuming the material is silicon, what is the built in potential V_{bi}?



2. (a) In the depletion approximation for the pn diode, why do the holes and electrons not continue to diffuse until the all the electrons and holes carrier concentrations are evenly dispersed throughout the device? (b) In the bulk regions of a pn diode, what is the value of the electric field. Explain your answer.

3. A diode is doped with $N_A = 10^{16} cm^3$ on the p -type side and $N_D = 10^{17} cm^3$ on the n -type side. (a) What is the depletion-layer width? (b) What are the values of x_p and x_n? (c) What is the value of the built-in potential of the junction? (d) What is the value of the maximum electric field, $\mathcal{E}_{Max}$?

4. (a) In the circuit below, find the voltages across each resistor assuming an ideal diode. (b) Find the voltages across the resistors assuming a constant voltage drop diode with V_{bi} = 0.7V.



5. Using the graph below, plot the load line and find the Q-point for the diode circuit in the figure below if V = 9V and R = $3k\Omega$.