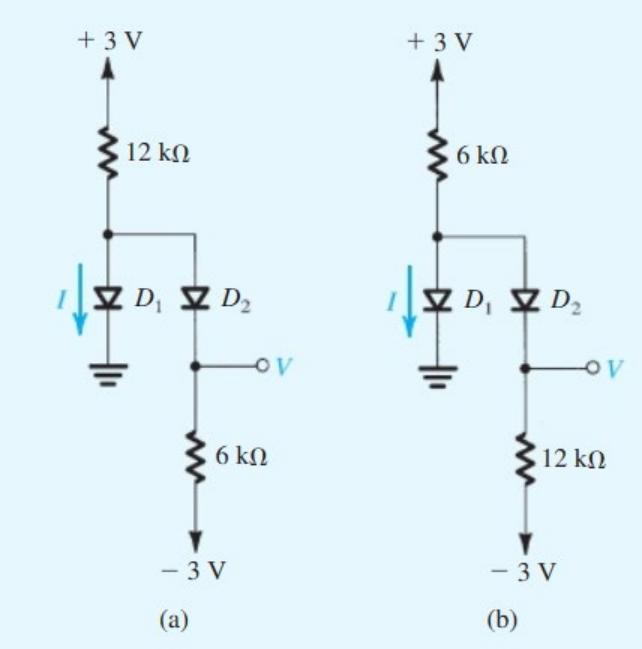
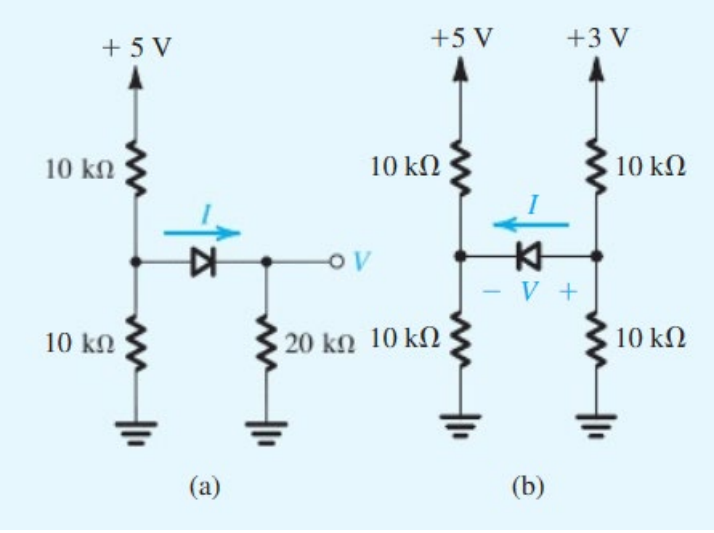
Spring 2024 – ECE 3020
Homework 9
Due: 03/25/2024

1. (P4.9) Assuming that the diodes in the circuits below are ideal, find the values of the labeled voltages and currents.



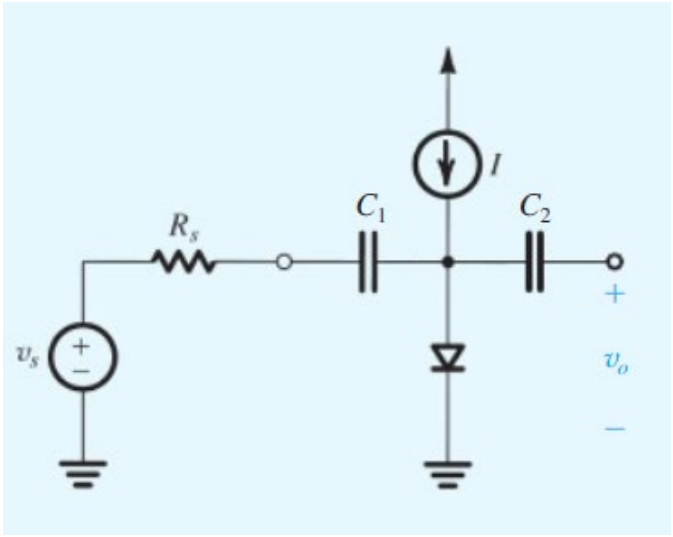
2. (P4.10)Assuming that the diodes in the circuits below are ideal, utilize Thevenin's theorem to simplify the circuits and thus find the values of the labeled currents and voltages.



3. (P4.36) A "1-mA diode" (i.e., one that has $v_D = 0.7V$ at $i_D = 1mA$) is connected in series with a 500-Ω resistor to 1.0V supply.
   i. Provide a rough estimate of the expected diode current.
   ii. Estimate the diode current more closely using iterative analysis.

4. Assuming the availability of diodes for which $v_D = 0.75V$ at $i_D = 1mA$, design a circuit that utilizes four diodes connected in series, in series with a resistor R connected to a 15-V supply. If R=582Ω, what is voltage across the string of diodes? [Solve iteratively].
5. (P4.48) In the circuit shown below, *I* is a dc current and vs is a sinusoidal signal. Capacitors C_1 and C_2 are very large; their function is to couple the signal to and from the diode but block the dc current from flowing into the signal source or the load (not shown). Use the diode small-signal model to show that the signal component of the output voltage is

$$v_o = v_s \frac{V_T}{V_T + IR_s}$$



6. Assume V_D=0.7 V at I_D= 1mA and V_T=25 mV for the diode below,
   i. Find the DC bias point for the diode
   ii. Determine r_d for the diode.
   iii. Build a small-signal model for the circuit
   iv. Find i_d and v_d as a function of v_s.