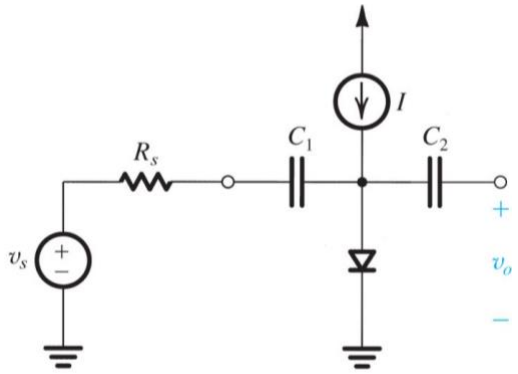
HW#5
(For Practice Only. Solution will be posted on 2/29)

1) In the circuit below, I is a dc current and v_s 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 (load is not shown in the circuit). Use the diode small-signal model to show that the signal component of the output voltage is

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

If v_s= 10 mV, find v_o for I = 1 mA, 0.1 mA, and 1 μA. Let $R_s = 1\ k\Omega$. At what value of I does v_o become one half of v_s?

(Note this circuit functions as a signal attenuator with the attenuation factor controlled by the value of the dc current I).



2) Consider a half-wave rectifier with a triangular-wave input of 5V peak-to-peak amplitude and zero average, and with R = 1 kΩ. Assume the diode can be represented by the constant voltage drop model with V_D = 0.7 V. Find the average value of v_o.