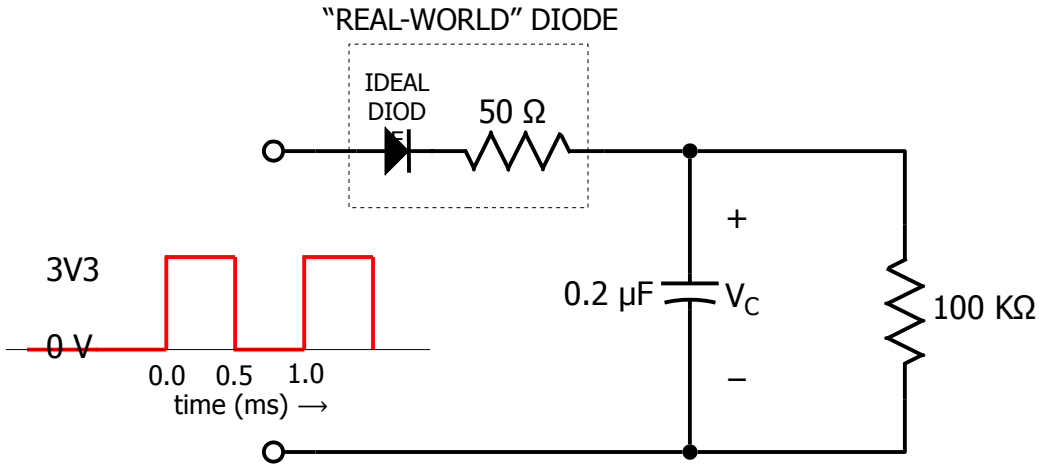
EE3 Fall 2020
Homework Problem 4



The input voltage has been at 0 V for a long time. All transients have died out. At time t = 0.0, a 3V3 pulse train begins. NOTE: the device inside the dashed-line box in an approximation of a real-world diode: when the left end is positive with respect to the right end, it is **forward-biased** and its resistance is 50 Ω. When the left end is negative, it is **reverse-biased** and its resistance is ∞.

a. When the input voltage is 3V3, the diode is forward-biased; 3V3 > v_c. What is the charging time constant? Neglect the effect of the 100 KΩ resistor.

b. When the input voltage is 0 V, the diode is reverse-biased, v_c > 0 V, and the capacitor can discharge only through the 100 KΩ resistor. What is the discharging time constant?

c. What is v_c at time 0.0^+?

d. What is v_c at time 0.5^+? You will need to evaluate the equation describing the behavior a shown on Slide 3 of Lecture 4 on CCLE Week 3.

e. What is v_c at time 1.0^+? Remember that v_c cannot change in the transition from 0^- to 0^+.

f. Based on what you see in (d.) and (e.), predict the value of v_c at time 1.5^+.