

Union College
 ECE248
 Spring 2015
 Quiz 1

Date: April, 9, 2015

Name: solution

Note: Answer all parts of all questions and show ALL work.

1. For each circuit in Figure 1 below indicate whether the diode is forward biased or reverse biased by circling the correct word after the letter referring to the circuit. Use the ideal model for the diodes.

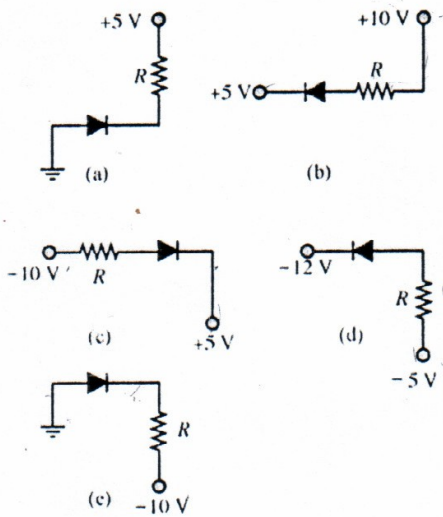


Figure 1

- a. Forward Reverse
 b. Forward Reverse
 c. Forward Reverse
 d. Forward Reverse
 e. Forward Reverse

$$V_{Th} = \frac{(12)(3k)}{6k + 3k} = 4V \quad R_{Th} = 6k // 3k = 2k\Omega$$

2. Use the circuit in Figure 2 below to complete the calculations in parts a. to c. below. Use the voltage offset diode model.

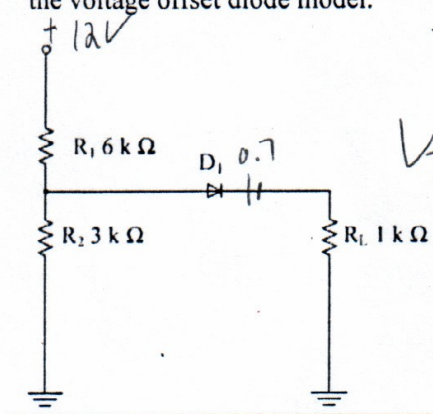
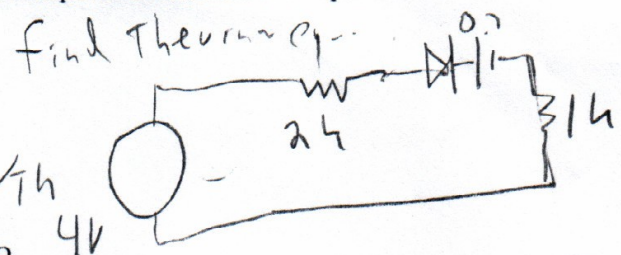


Figure 2



a. Calculate Current through R_L .

$$I_{R_L} = \frac{4 - 0.7}{2k + 1k} = 1.1mA$$

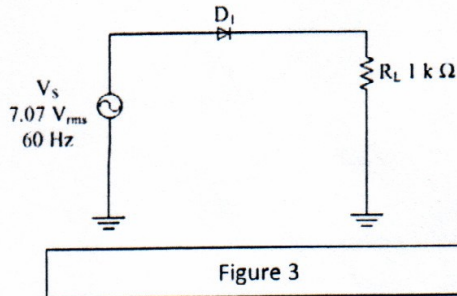
b. Calculate the power dissipated in R_L .

$$P_{R_L} = I_{R_L}^2 R = (1.1mA)^2 (1k) = 1.21mW$$

c. Calculate the power dissipated in the diode D_1 .

$$P_D = V_D I_D = (0.7)(1.1mA) = 0.77mW$$

3. Use the circuit in figure 3 below to answer question 3 parts a. and b. using the diode offset model.



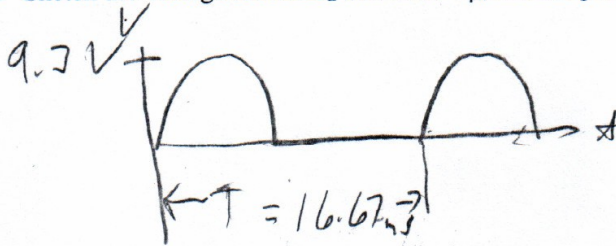
$$V_{max} = V_{pk} - 0.7$$

$$V_{pk} = (7.07)(1.414) = 9.996$$

$$= 10 \text{ V}$$

$$V_{max} = 9.3 \text{ V}$$

- a. Sketch the voltage across R_L and label V_{pk} and the period with values.

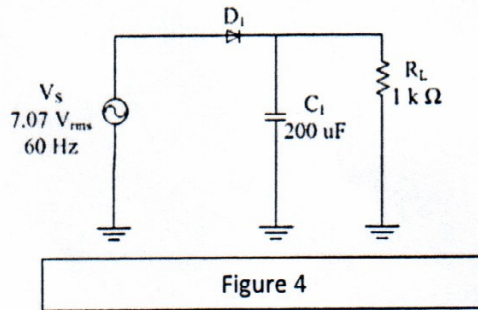


$$T = \frac{1}{f} = \frac{1}{60} = 16.67 \text{ ms}$$

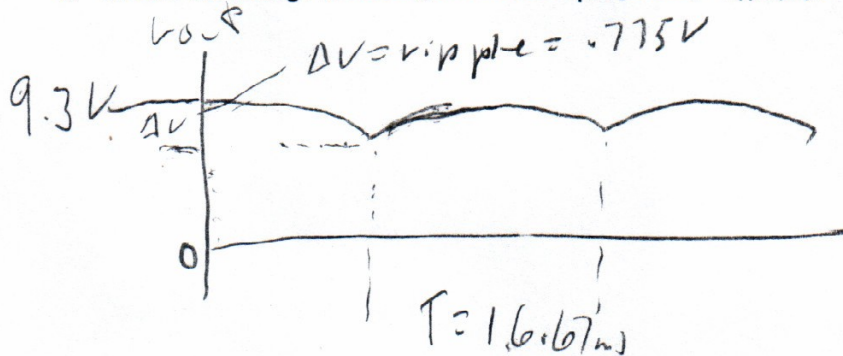
- b. Calculate V_{DC} .

$$V_{DC} = \frac{V_p}{\pi} = \frac{9.3}{\pi} = 2.96 \text{ V}_{DC}$$

4. The circuit in Figure 4 below is the same as the one in Figure 3 except that a capacitor has been added. Answer the questions parts a. and b. below.



- a. Sketch the voltage across R_L and label: V_{pk} , period, $V_{ripple, pk-pk}$ all with values.



- b. Use the equation developed in class to calculate the peak to peak ripple voltage.

$$V_{ripple} = \frac{V_{pk}}{R_L} \cdot \frac{1}{fC} = \frac{I_C}{fC}$$

$$V_{ripple} = \frac{9.3}{1k} \cdot \frac{1}{60(200 \times 10^{-6})} = 0.775V_{pk}$$