Electronics I

Examen #1 → miércoles 11de septiembre @ S-227

9/4/2019

- **Amplificadores**
- **Diodos / Diodos Zener**
- **Rectificadores**

BATE:

Todo estudiante podrá traer su propio bate al examen. No obstante, dicho bate deberá circunscribirse a las siguientes características y normas establecidas:

1. **Una hoja tamaño carta por ambos lados**
2. **No se permiten:**
   - **problemas resueltos**
   - **problemas del libro**
   - **fotocopias**
3. **Deberá ser entregado al profesor de ser solicitado**

****** La falta de cumplimiento de dichas normas resultara en la reprobación del examen.***

Last Lecture → Rectifiers

9/4/2019

Half Wave

- **Diode Ratings**

$$I_{max} = \frac{V_S - V_D}{R}$$

$$PIV = V_S$$

- **Average Output**

$$\overline{V_0} \approx \frac{V_S}{\pi} - \frac{V_D}{2}$$

$$\overline{I_L} \approx \frac{\overline{V_0}}{R}$$

Full Wave

Center-Tap

- **Diode Ratings**

$$I_{max} = \frac{V_S - V_D}{R}$$

$$PIV = 2V_S - V_D$$

- **Average Output**

$$\overline{V_0} = \frac{2V_S}{\pi} - V_D$$

$$\overline{I_L} = \frac{\overline{V_0}}{R}$$

Bridge

- **Diode Ratings**

$$I_{max} = \frac{V_S - 2V_D}{R}$$

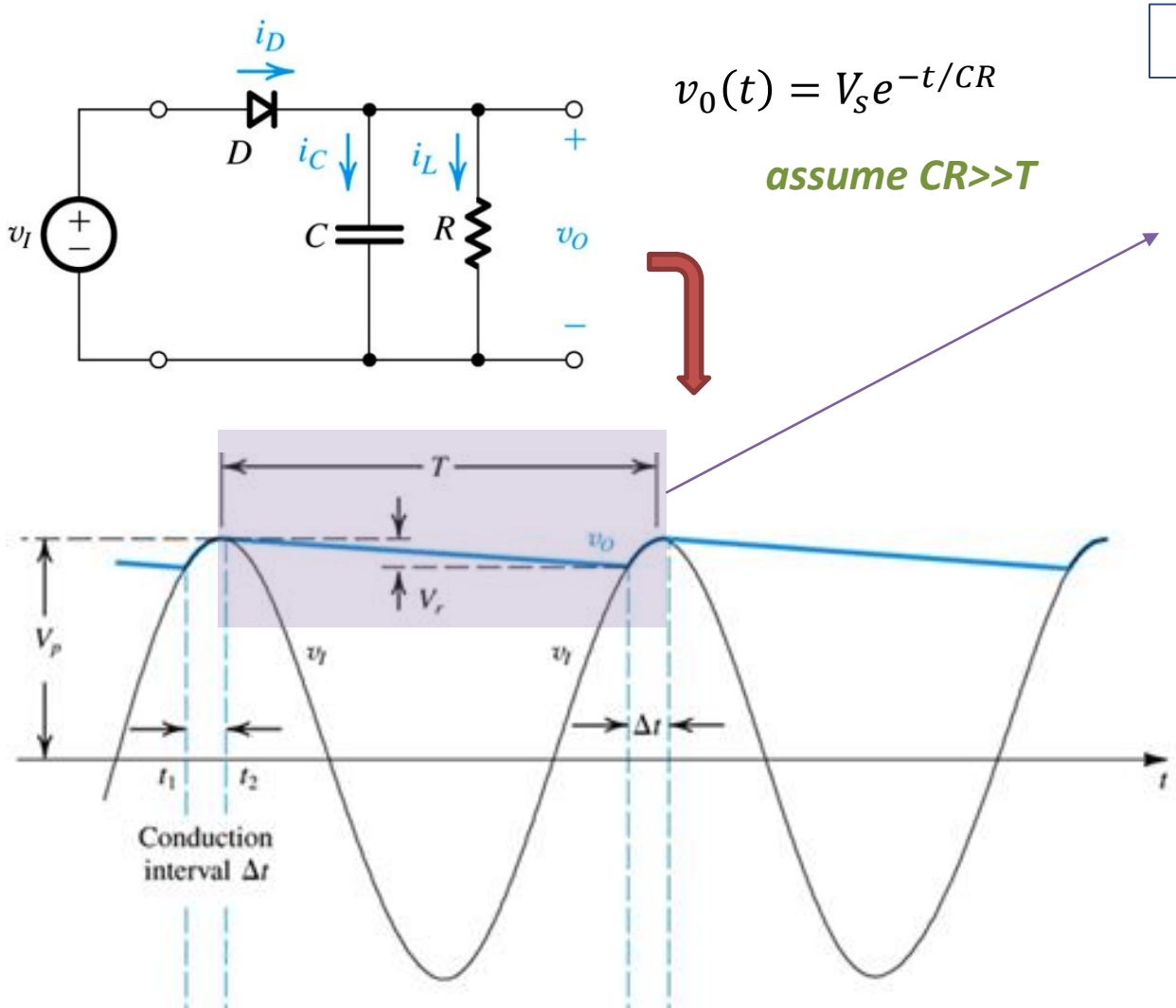
$$PIV = V_S - V_D$$

- **Average Output**

$$\overline{V_0} = \frac{2V_S}{\pi} - 2V_D$$

$$\overline{I_L} = \frac{\overline{V_0}}{R}$$

The Rectifier with a Filter Capacitor



$$v_0(t) = V_s e^{-t/CR}$$

assume CR>>T

Assuming Ideal Diode!

- **Half-Wave**

$$\overline{V_0} = V_S - \frac{V_r}{2}$$

$$\overline{I_L} = \frac{\overline{V_0}}{R}$$

$$V_r = \frac{V_S}{fCR} \approx \frac{I_L}{fC}$$

$$\Delta\theta \approx \sqrt{2V_r/V_S}$$

$$i_{Davg} = I_L\left(1 + \pi\sqrt{2V_S/V_r}\right)$$

$$i_{Dmax} = I_L\left(1 + 2\pi\sqrt{2V_S/V_r}\right)$$

- **Full-Wave**

$$\overline{V_0} = V_S - \frac{V_r}{2}$$

$$\overline{I_L} = \frac{\overline{V_0}}{R}$$

$$V_r = \frac{V_S}{2fCR} \approx \frac{I_L}{2fC}$$

$$\Delta\theta \approx \sqrt{2V_r/V_S}$$

$$i_{Davg} = I_L\left(1 + \pi\sqrt{V_S/2V_r}\right)$$

$$i_{Dmax} = I_L\left(1 + 2\pi\sqrt{V_S/2V_r}\right)$$

Problem D 4.78

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It is required to use a peak rectifier to design a dc power supply that provides an average dc output voltage of 15V on which a maximum of ±1-V ripple is allowed. The rectifier feeds a load of 150Ω. The rectifier is fed from the line voltage ($120V_{rms}$, 60Hz) through a transformer. The diodes available have a 0.7-V drop when conducting. If the designer opts for the half-wave rectifier circuit:

a) **Specify the rms voltage that must appear across the transformer secondary.**
b) **Find the required value of the filter capacitor and the voltage rating.**
c) **Find the maximum reverse voltage that will appear across the diode, and specify the PIV rating of the diode.**
d) **Calculate the average current rating through the diode during conduction.**
e) **Calculate the peak diode current.**

Problem P 1.62

An amplifier with an input resistance of 10kΩ, when driven by a current source of 1μA and a source resistance of 100kΩ, has a short-circuit output current of 10mA and an open-circuit output voltage of 10V. The device is driving a 4k Ω load Give the values of the voltage gain, current gain, and power gain. Determine the type of amplifier.

Problem P 4.93

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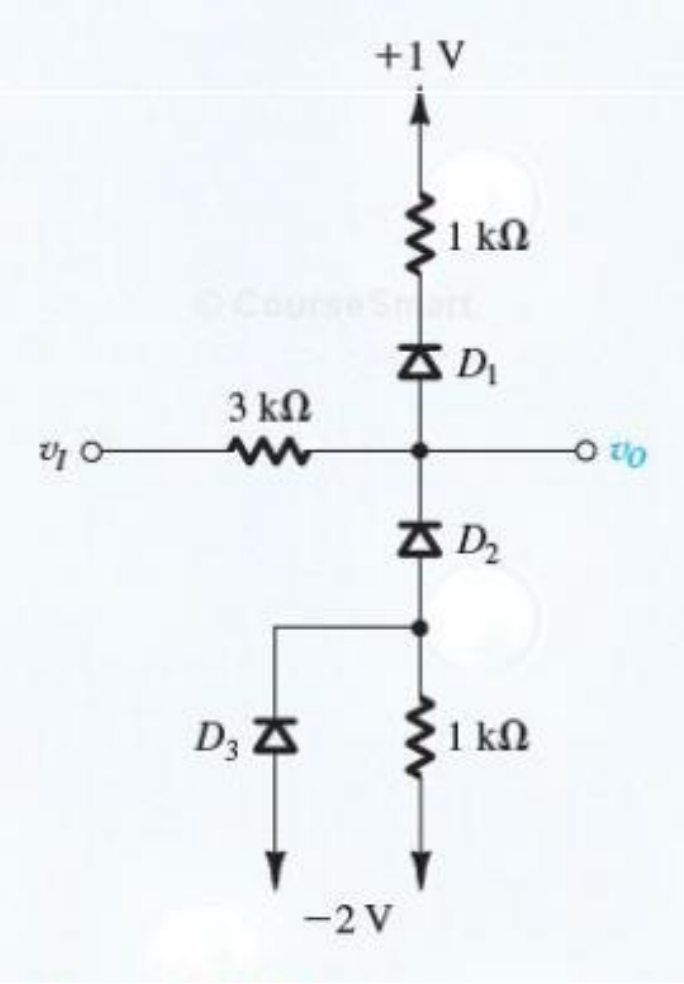
Sketch and label the voltage transfer characteristic v_0 versus v_i of the circuit provided over a ±10-V range of input signals. Assume that the diodes can be represented by the constant-voltage-drop model with V_D=0.7V. What are the slopes of the characteristic at the extreme ±10-V levels.



Problem 4.74

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The circuit provided below implements a complementary-output rectifier. Sketch and clearly label the waveforms of V_0^+ and V_0^-. Assume a 0.7-V drop across each conducting diode. If the magnitude of the average of each output is to be 15V, find the required amplitude of the sine wave across the entire secondary winding. What is the PIV of each diode?