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:

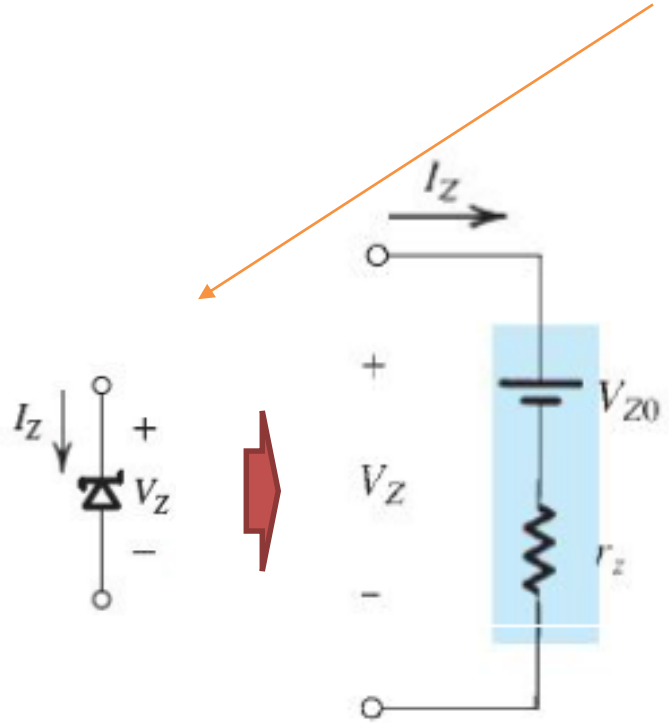
1. **Una hoja tamaño carta por ambos lados**
2. **No se permiten:**
   - **problemas resueltos**
   - **problemas del libro**
   - **fotocopias**
3. **Deberá ser entregado al profesor de ser solicitado**

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

Last Lecture → Zener Diode

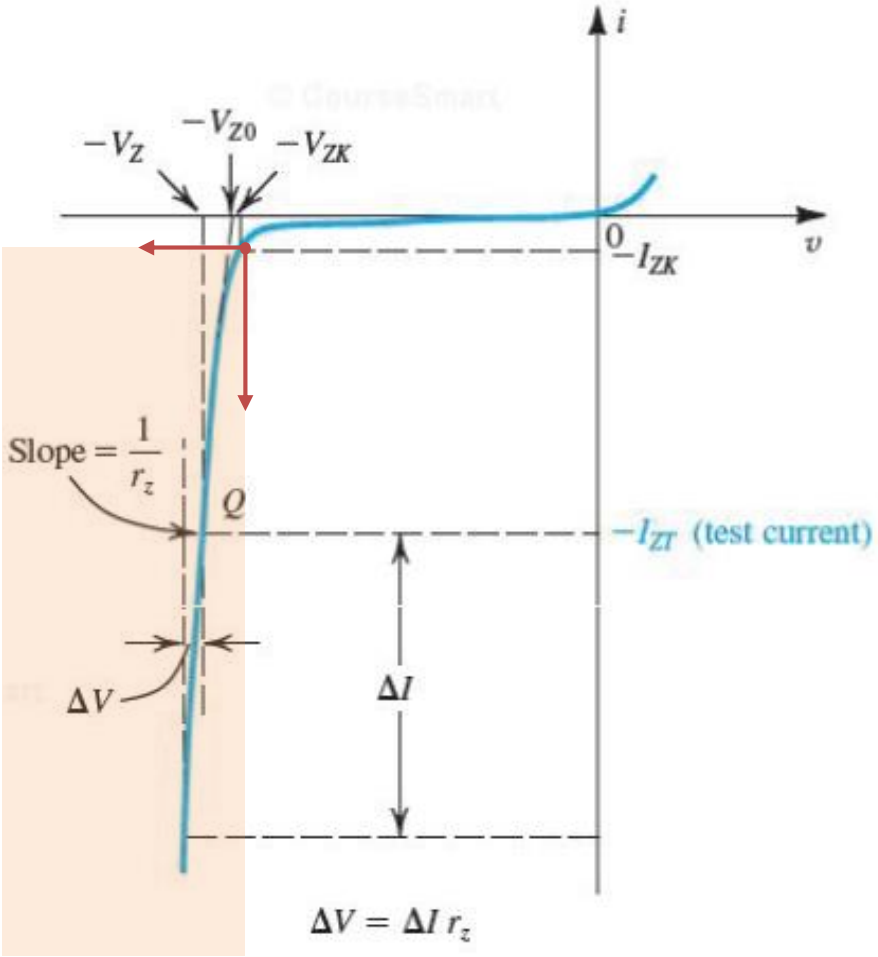
9/4/2019

- **Under certain circumstances, diodes may be intentionally used in the reverse breakdown region.**
- **These are referred to as Zener Diodes.**



$$V_Z = V_{Z0} + \underbrace{r_z \cdot i_z}_{= v_z \rightarrow \text{small signal behavior}}$$

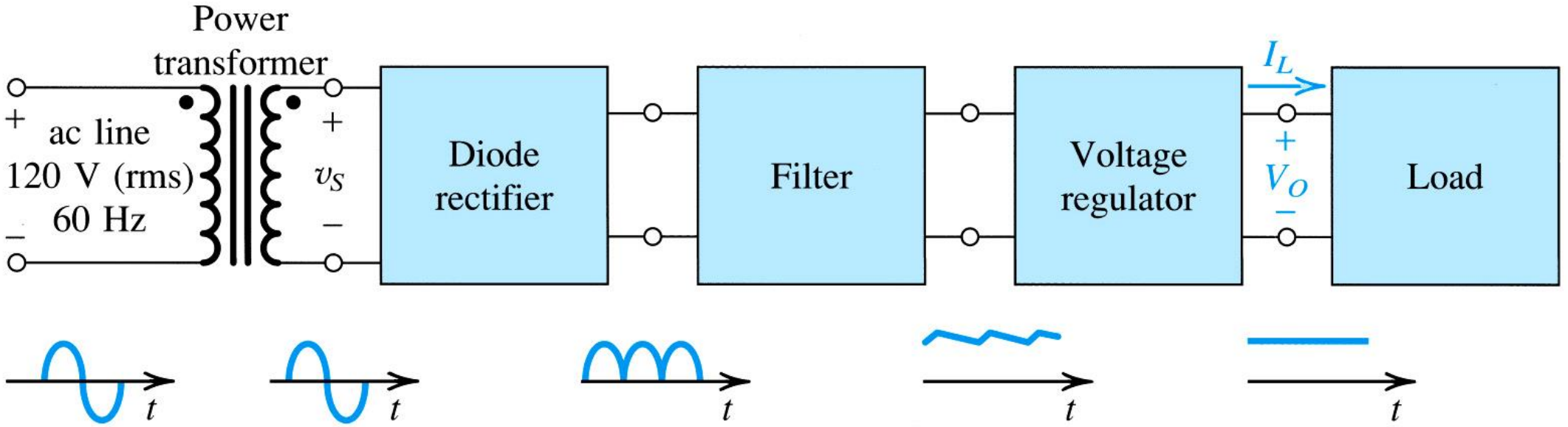
*** for $V_Z >= V_{Z0}$
$I_Z >= I_{ZK}$



Last Lecture → DC Power Supply

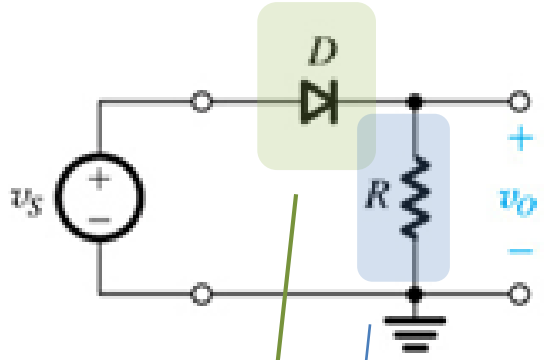
9/4/2019

- **Power Transformer** – lowers down the 120V-AC input voltage and provides electrical isolation
- **Diode rectifiers** – converts the AC signal to an unipolar output
- **Filter** – reduces the voltage fluctuations of the rectified signal
- **Voltage Regulator** - reduces the ripple and stabilizes the output voltage from variations caused by changes in the load current

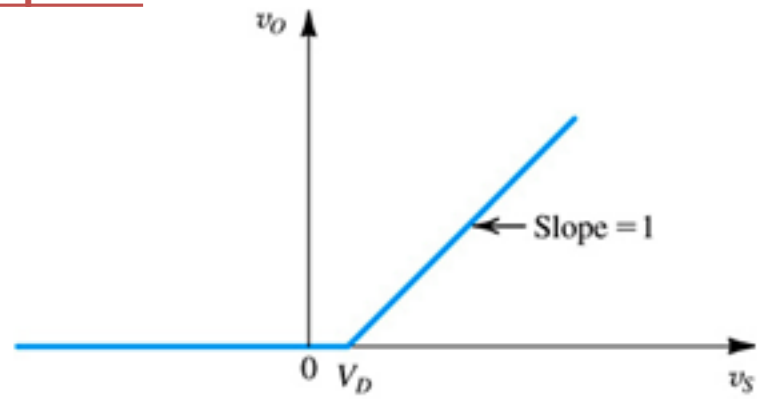


Last Lecture → Half Wave Rectifier

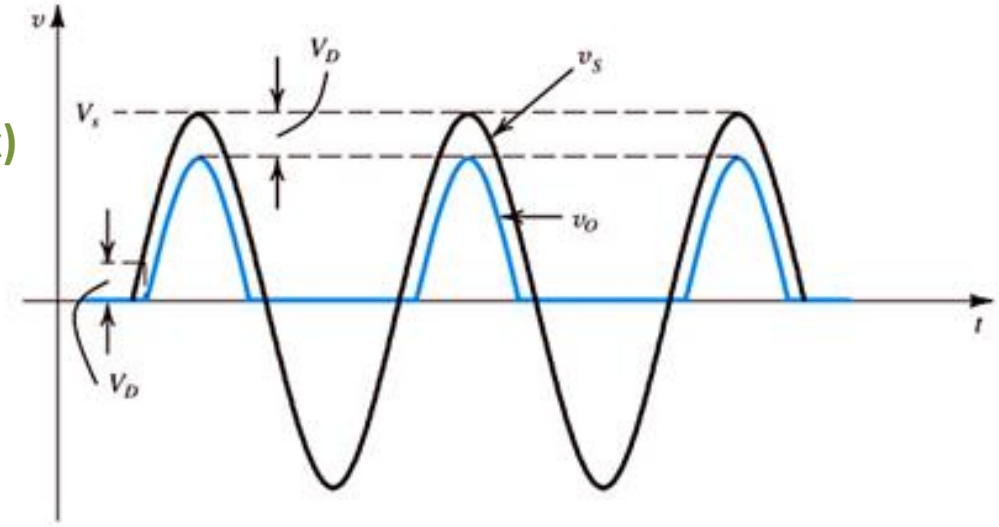
9/4/2019



DC Response



Transient Response



Diode Parameter Specifications:

- **Current-handling capability – $I_D(max)$**
- **Peak inverse voltage – PIV = $V_R(max)$**

Output Specifications:

- **Average Voltage – $V_0(avg)$**
- **Average Current – $I_L(avg)$**

- **Diode Ratings**

$$I_D(max) = \frac{V_S - V_D}{R}$$

$$PIV = V_S$$

- **Conduction Angle**

$$\theta = \sin^{-1}\left(\frac{V_D}{V_S}\right)$$

$$\Delta\theta = \pi - 2\theta$$

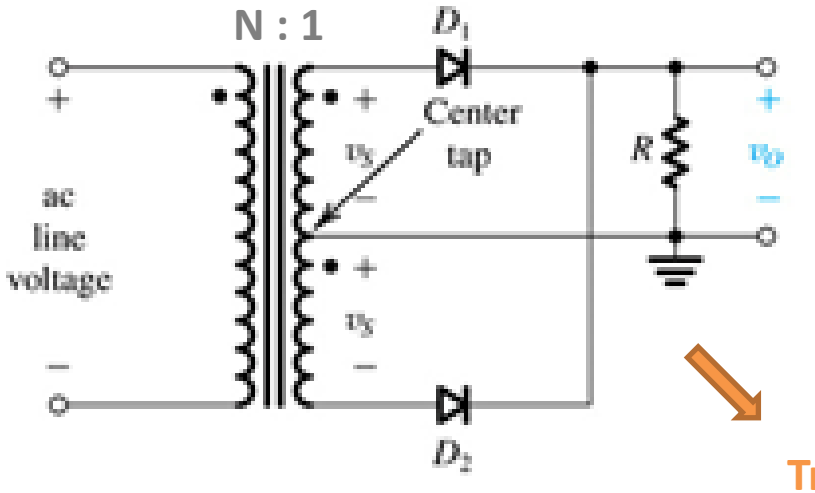
- **Average Output**

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

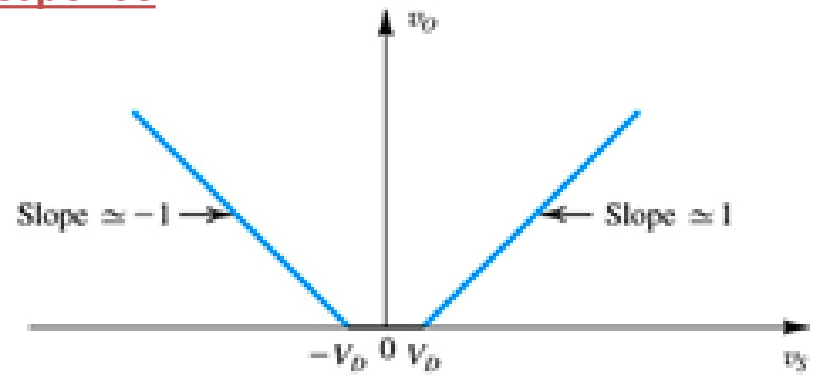
$$\overline{I_L} \approx \frac{\overline{V_0}}{R}$$

The Full-Wave Rectifier

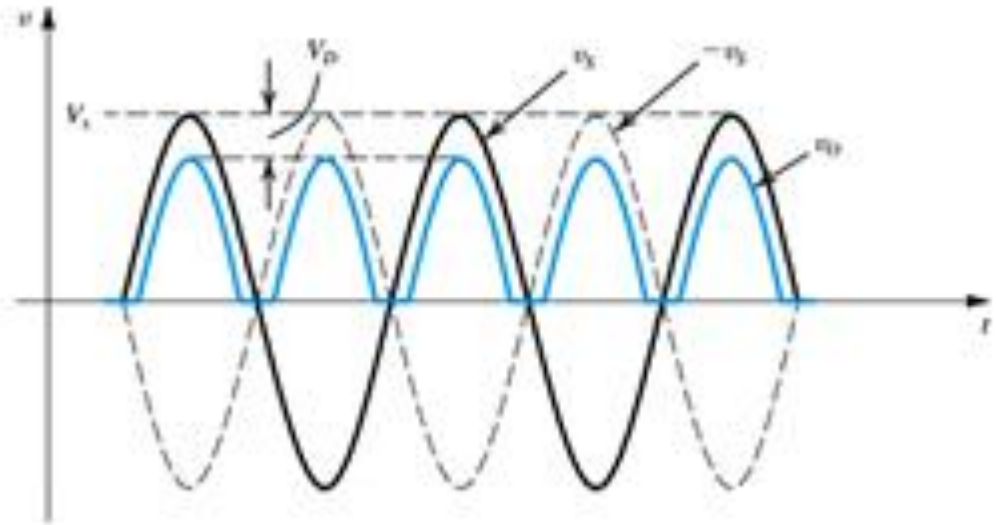
9/4/2019



DC Response



Transient Response



Diode Parameter Specifications:

- **Current-handling capability – I_D(max)**
- **Peak inverse voltage – PIV = V_R(max)**

Output Specifications:

- **Average Voltage – V_0(avg)**
- **Average Current – I_L(avg)**

- **Diode Ratings**

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

$$PIV = 2V_S - V_D$$

- **Conduction Angle**

$$\theta = \sin^{-1}\left(\frac{V_D}{V_S}\right)$$

$$\Delta\theta = \pi - 2\theta$$

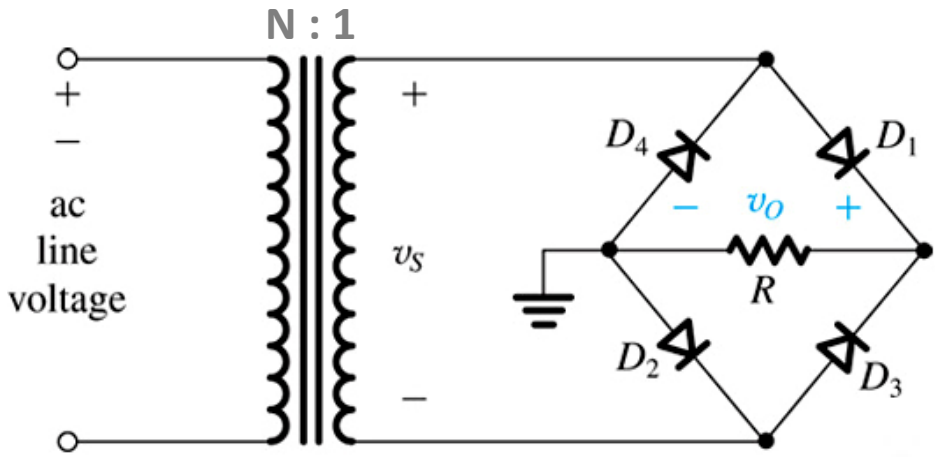
- **Average Output**

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

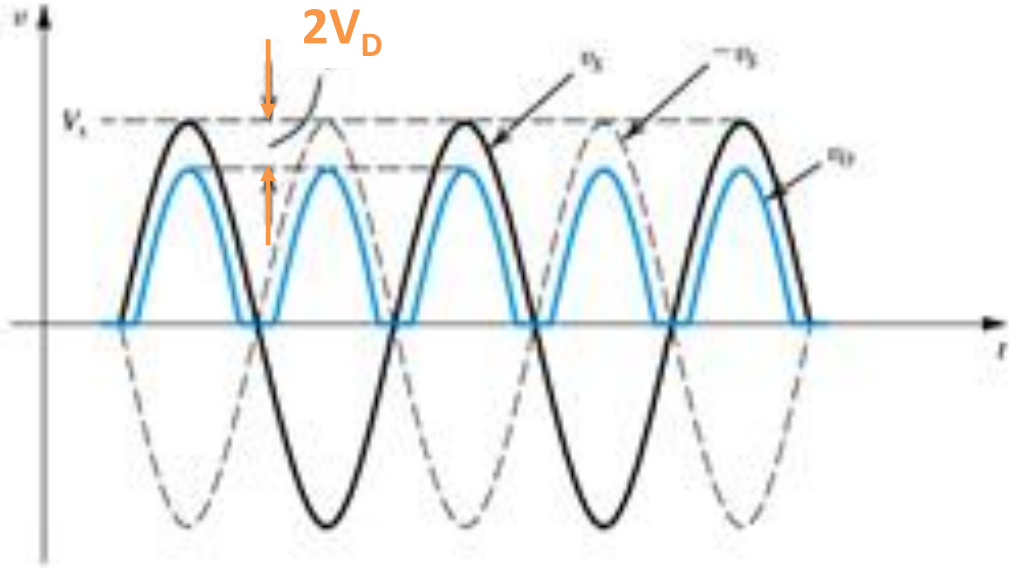
$$\overline{I_L} \approx \frac{\overline{V_0}}{R}$$

The Bridge Rectifier

9/4/2019



Transient Response



Diode Parameter Specifications:

- Current-handling capability – I_D(max)
- Peak inverse voltage – PIV = V_R(max)

Output Specifications:

- Average Voltage – V_0(avg)
- Average Current – I_L(avg)

- **Diode Ratings**

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

$$PIV = V_S - V_D$$

- **Conduction Angle**

$$\theta = \sin^{-1}\left(\frac{2V_D}{V_S}\right)$$

$$\Delta\theta = \pi - 2\theta$$

- **Average Output**

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

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

Rectifiers

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**

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

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

Problem 4.71

9/4/2019

It is required to design a full-wave rectifier circuit using a center-tap transformer to provide an average output voltage of a) 10V and b) 100V. In each case find the required turn ratio of the transformer. Assume that a conducting diode has a voltage drop of 0.7V. The ac line is 120 V_{rms}.