Electronic Devices and Circuits

EME306

(Summer 2021-2022)

Lecture 5

Full-Wave Rectifiers

INSTRUCTOR

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➤ **Contents**

FULL-WAVE RECTIFIERS

➢ A full-wave rectifier allows unidirectional (one-way) current through the load during the entire of the input cycle.

➢ The output voltage of full-wave rectification have a frequency twice the input frequency
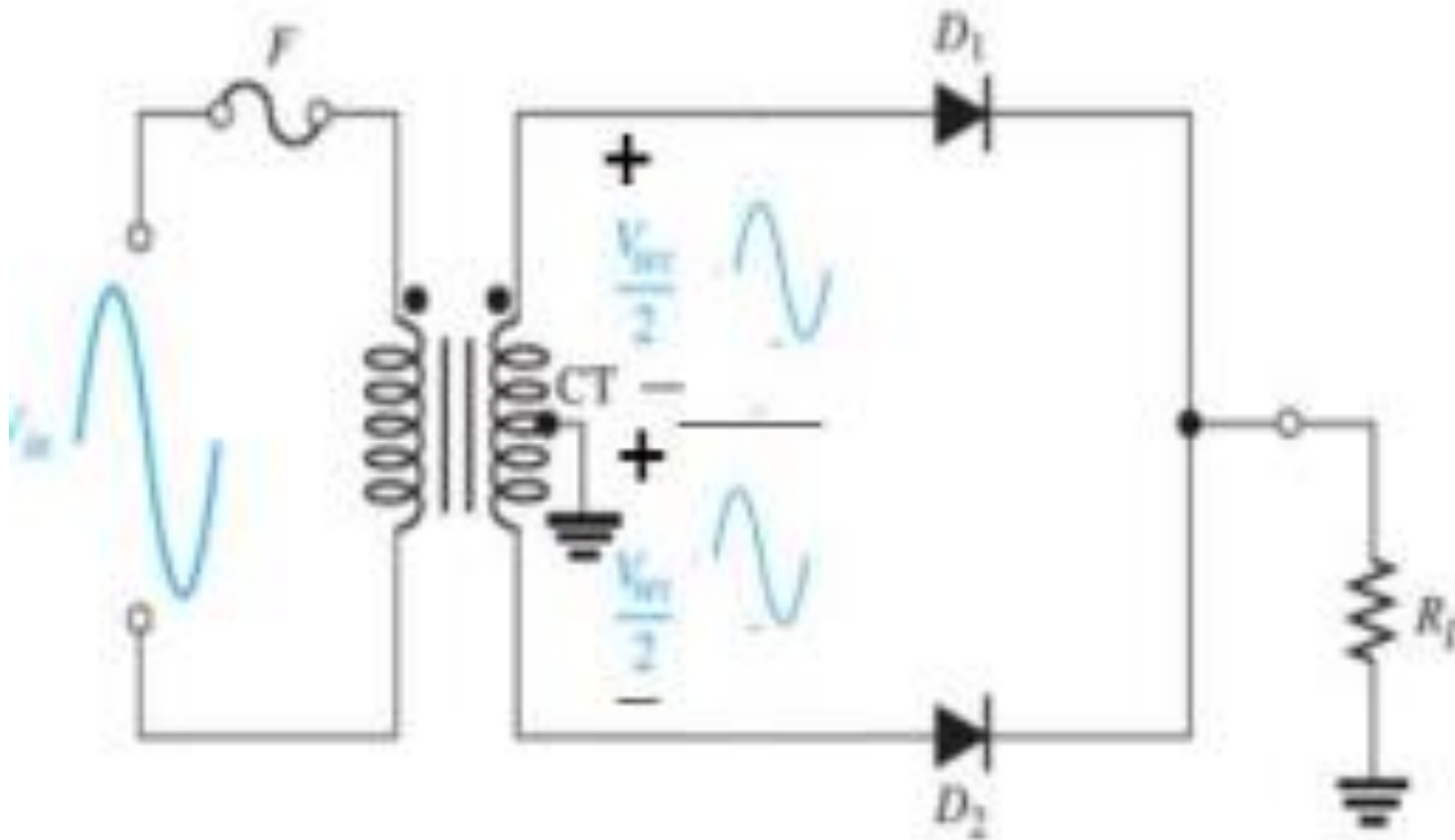
➢ $f_o=2f_i$

$$f_o=2f_i$$
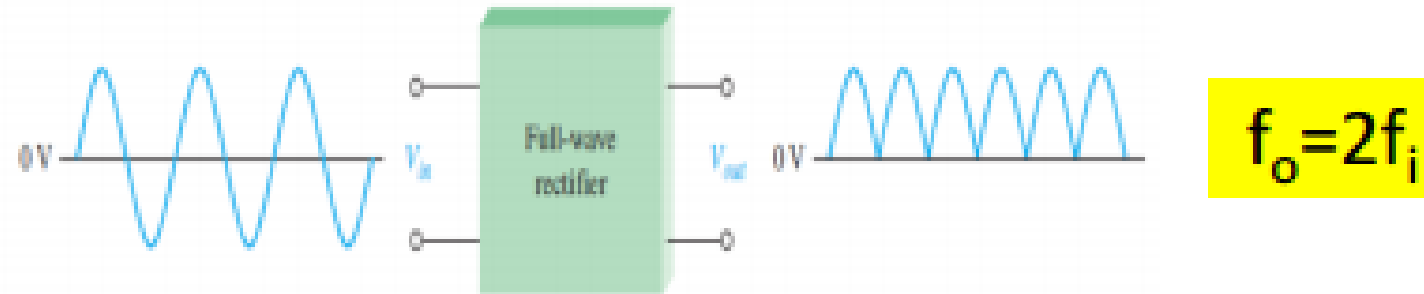
Full-wave rectifier average value

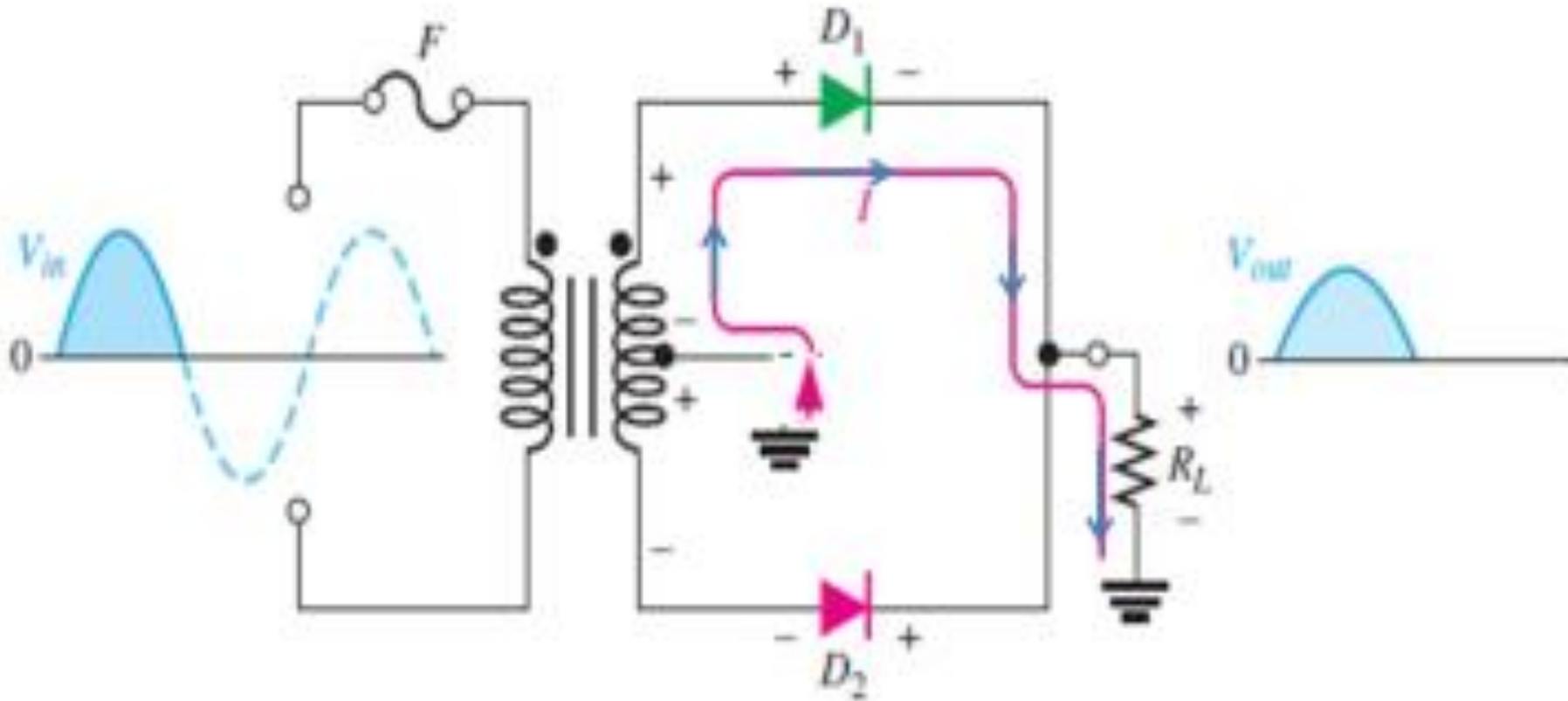$$V_{avg} = \frac{2v_P}{\pi} = 2*.318v_p = .636v_p$$

Types of full wave rectifiers

➢ 1- Center-Tapped Full-Wave Rectifier Operation

For +ve half cycle

➢ This condition will forward-biases diode D1 and reverse biases diode D2.
➢ The current path is through D1 and the load resistor RL, as indicated

For -ve half cycle

➢ This condition will forward-biases diode D2 and reverse biases diode D1.
➢ The current path is through D2 and the load resistor RL, as indicated

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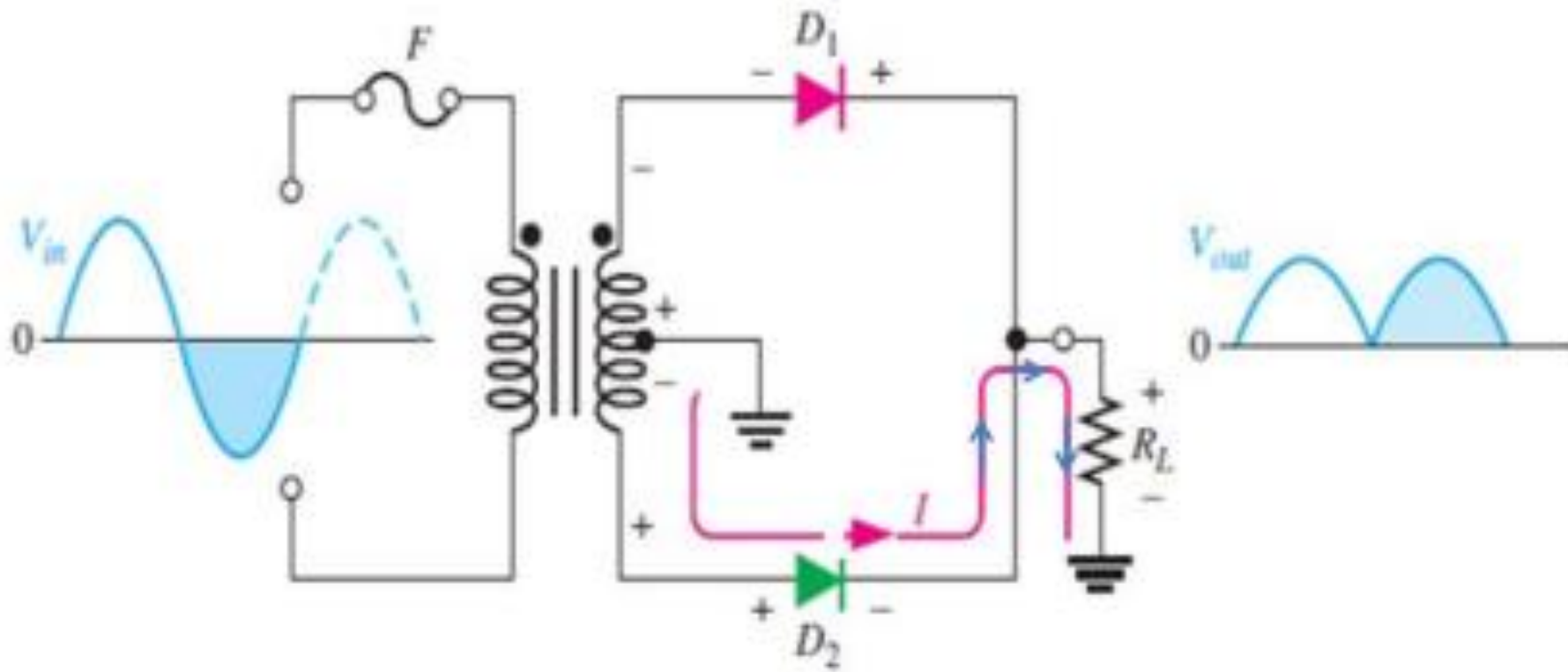
❖ The output current during both the positive and
negative portions of the input cycle is in the same
direction through the load
❖ The output voltage developed across the load resistor is
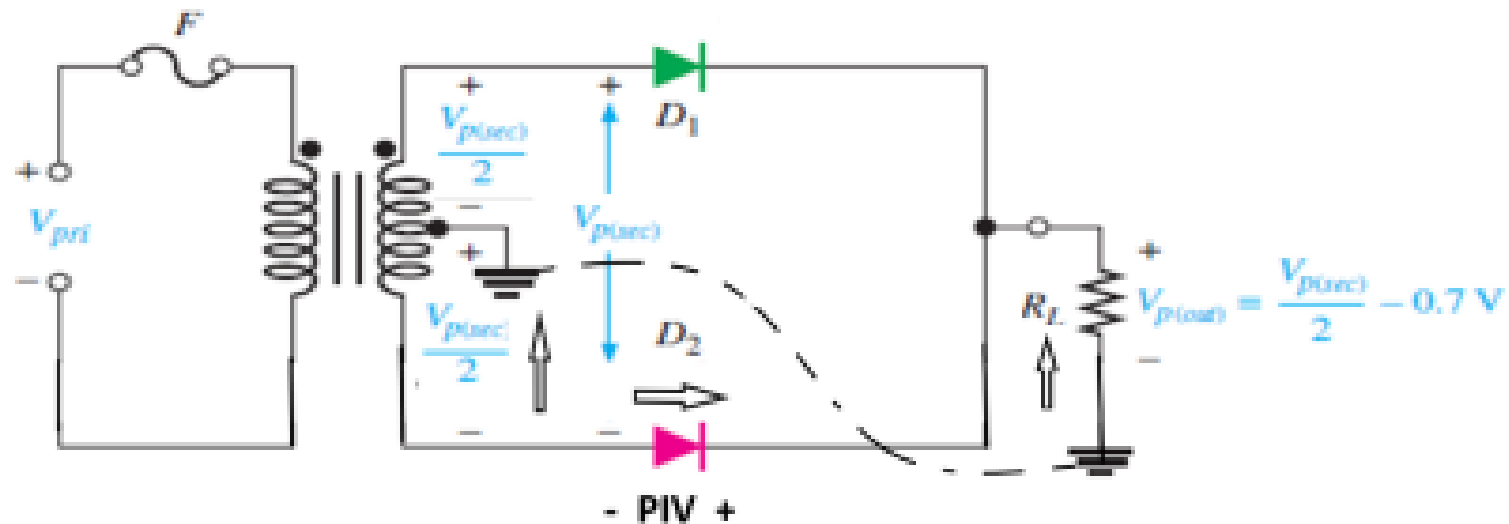a full-wave rectified dc voltage, as shown

$$f_o = 2f_i$$

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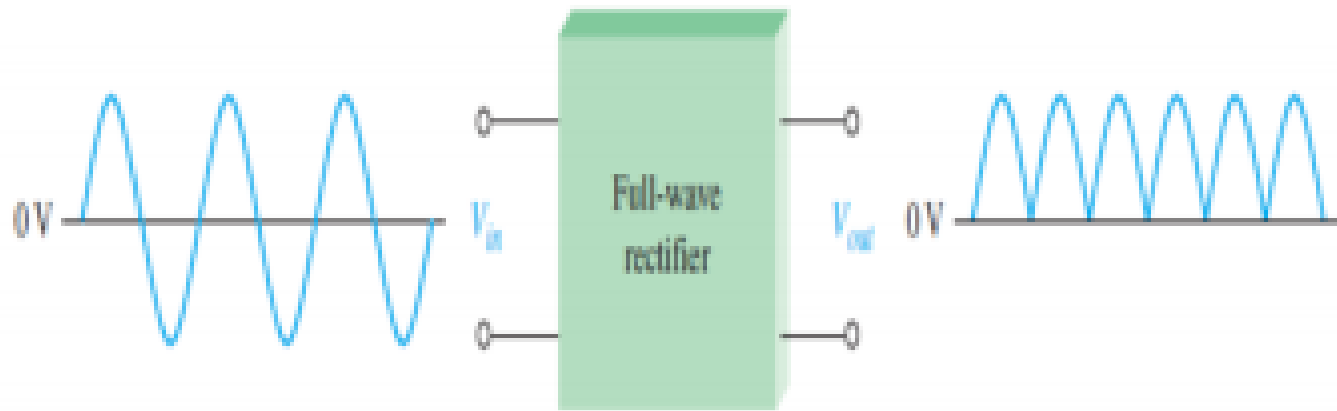
Effect of the Turns Ratio on the Output Voltage

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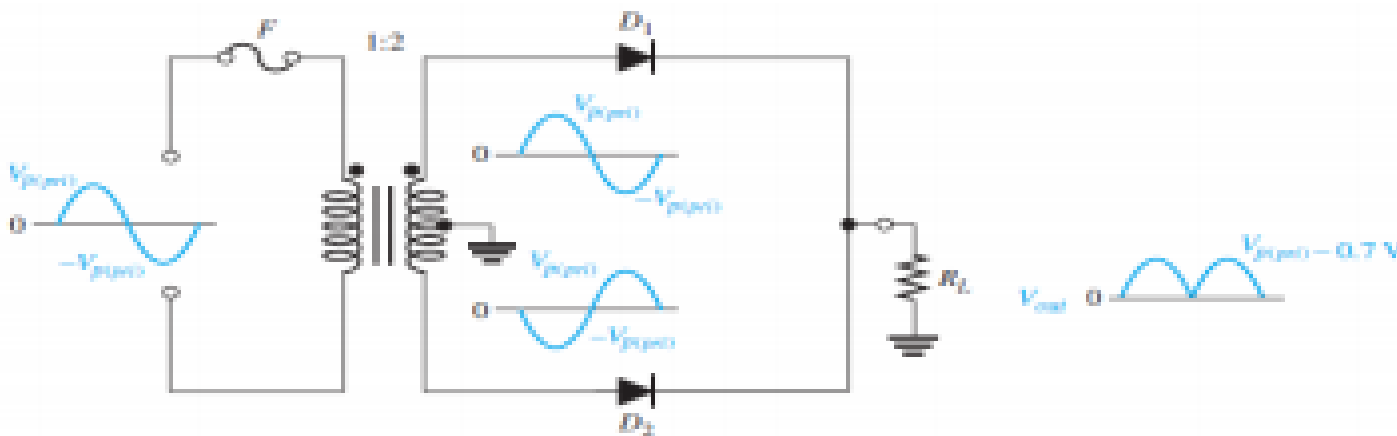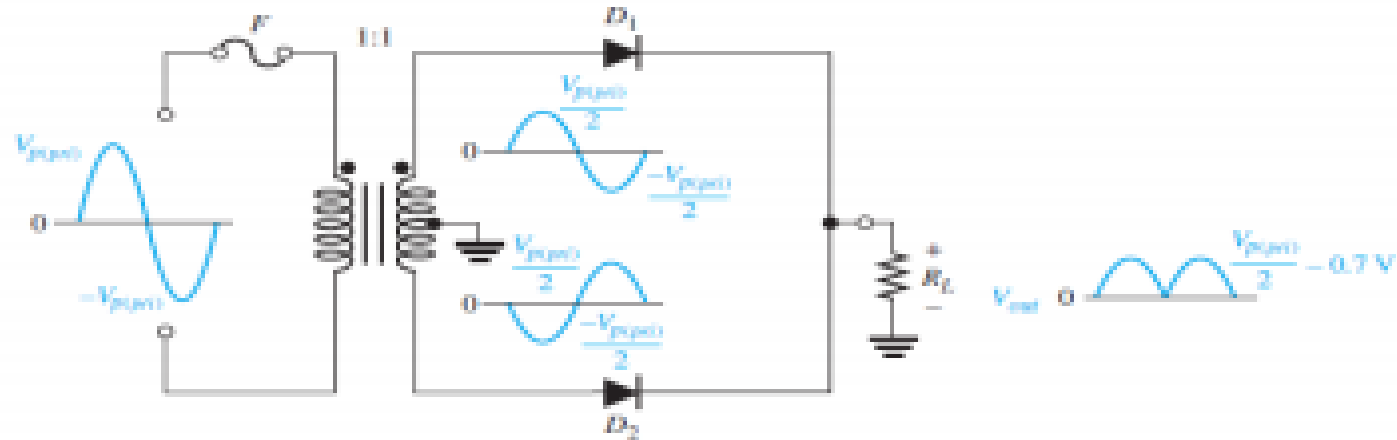
When D_1 is on, while D_2 off

The peak inverse voltage across D_2 will be

$$PIV = V_{p(out)} + \left(\frac{V_{P(Sec)}}{2}\right) = \left(\frac{V_{P(Sec)}}{2} - 0.7\right) + \left(\frac{V_{P(Sec)}}{2}\right) = V_{P(Sec)} - 0.7$$
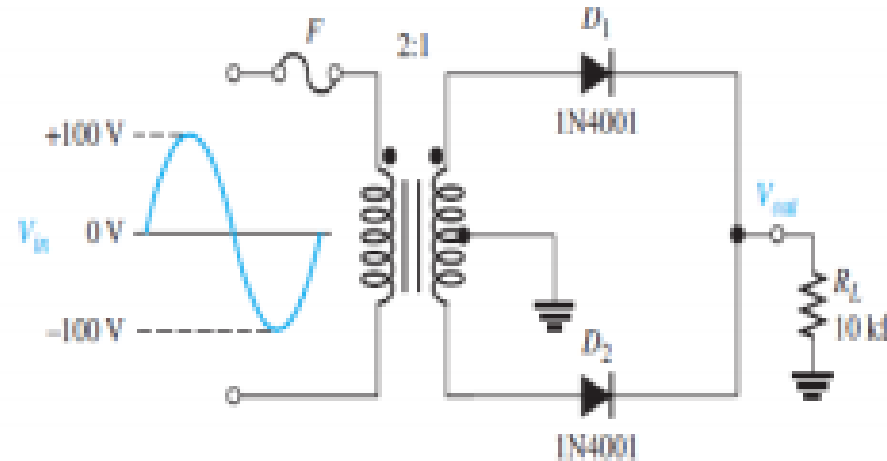

Since $Vp_{(out)} = (V_{p(sec)}/2) - 0.7$

Then

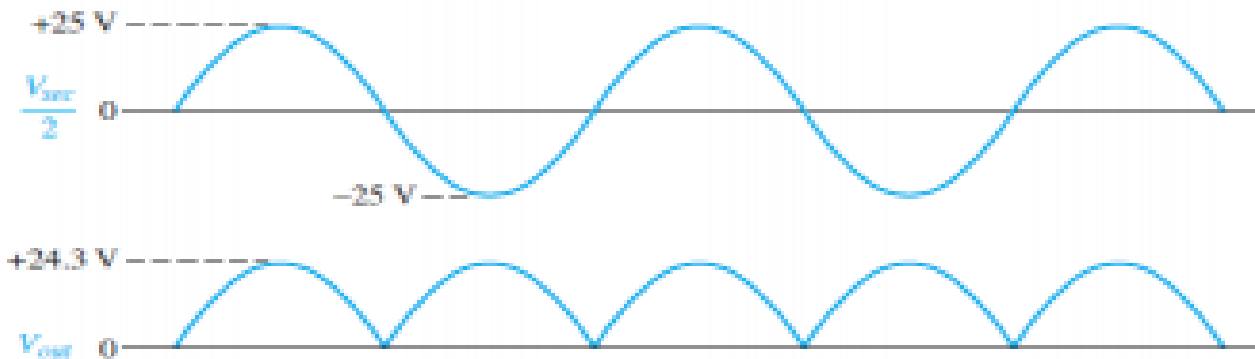$$PIV = 2V_{P(out)} + 0.7$$

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Example

For the circuit shown, find the PIV?. The sketch V_{out}

$$V_{p(sec)} = nV_{p(pri)} = 0.5(100 \text{ V}) = 50 \text{ V}$$
$$Vp_{(out)} = (V_{p(sec)}/2) - 0.7 = (50/2) \, 0.7 = 24.3v$$

$$PIV = 2V_{P(out)} + 0.7 = 2*(24.3) + 0.7 = 49.3V$$

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