

Chapter 4

AC-DC Full Wave Rectifier Circuits



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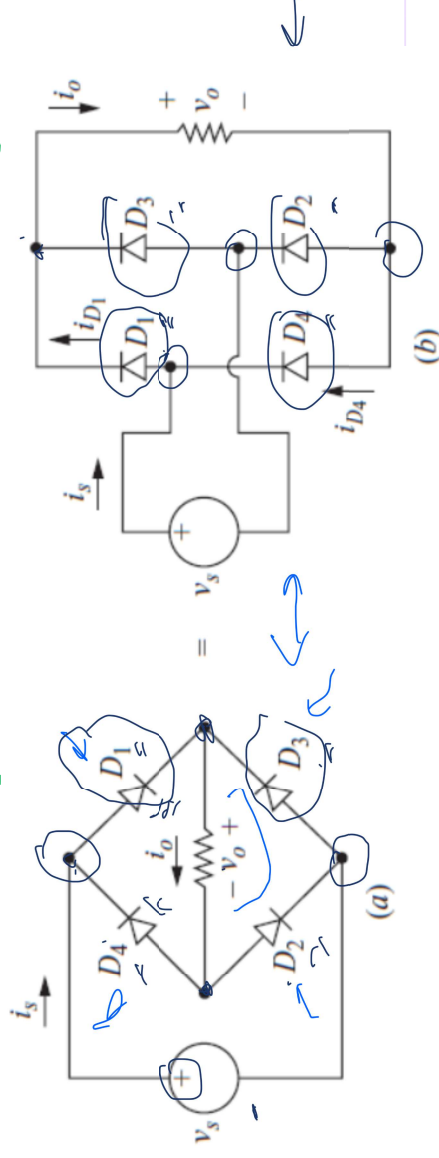
SINGLE-PHASE FULL-WAVE RECTIFIERS

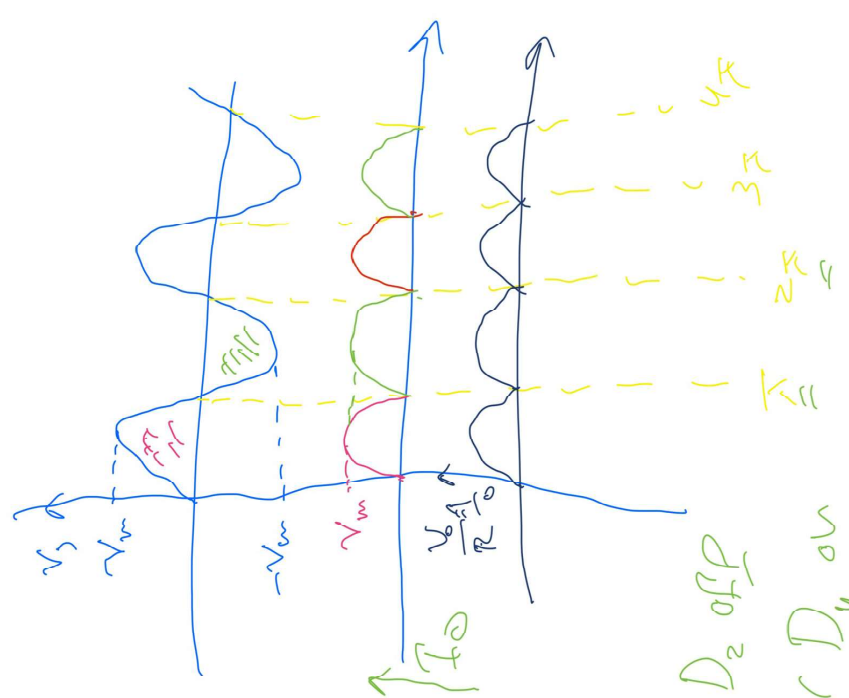
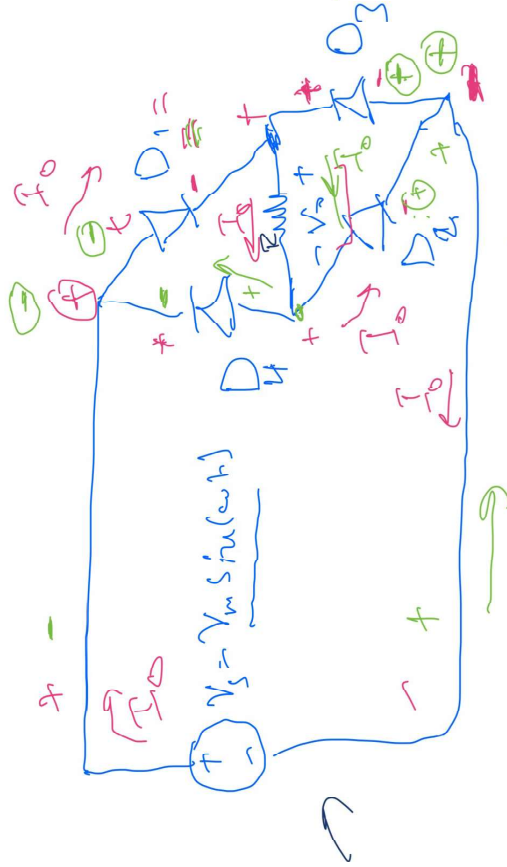
There are two basic single-phase full-wave rectifiers: Bridge Rectifier and Center-Tapped Transformer Rectifier

$AC \rightarrow DC$

a. The Bridge Rectifier

- Diodes D1 and D2 conduct together, and D3 and D4 conduct together
- Kirchhoff's voltage law around the loop containing the source, D1, and D3 shows that D1 and D3 cannot be on at the same time.
- Similarly, D2 and D4 cannot conduct simultaneously.
- The load current can be positive or zero but can never be negative.



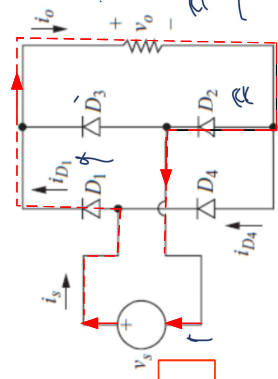
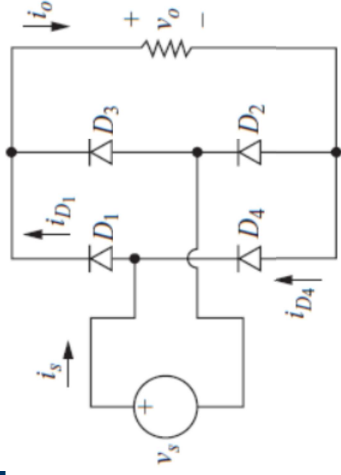


$V_s > 0$
 D_1 on, D_2 off
 D_3 off, D_4 on

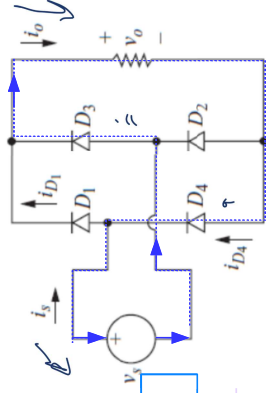
$V_s < 0$
 D_1 off, D_2 on
 D_3 on, D_4 off
 $V_o = V_s$

AMN

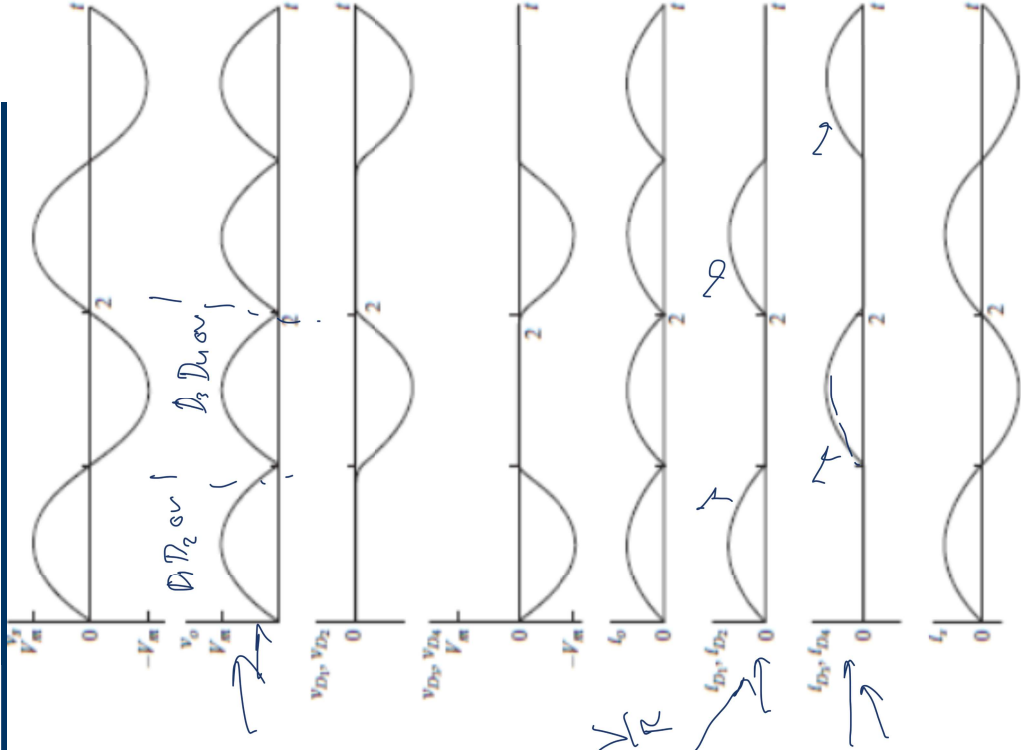
SINGLE-PHASE FULL-WAVE RECTIFIERS



D1 and D2 conduct



D3 and D4 conduct



$$V_{avg} = V_{dc} = \frac{1}{2\pi} \int_0^{2\pi} (V_m \sin \omega t) d\omega t$$

$$= \frac{2V_m}{\pi}$$

$$V_{rms} = \sqrt{\frac{1}{2\pi} \int_0^{2\pi} (V_m \sin \omega t)^2 d\omega t}$$

$$= \sqrt{\frac{V_m^2}{2}}$$

Problem 4-1 ~~Page 164~~

Full wave Rectifier with $R = 18$, $V_{avg} = 120V$

Find I_{avg} into load $\Rightarrow V_m = 120\sqrt{2} = 169.7$

$$V_{avg} = \frac{1}{2\pi} \int_0^{2\pi} V_m \sin(\omega t) d\omega = \frac{2V_m}{\pi} = \frac{2 \times 169.7}{\pi}$$

$$I_{avg} = \frac{V_{avg}}{R} = \frac{2 \times 169.7}{\pi \times 18} = \dots A$$

$$I_{avg} = \frac{V_m}{R} = \frac{169.7}{18} = \dots A$$

$$I_{avg} = \frac{V_{avg}}{R} = \frac{\frac{169.7}{\sqrt{2} \times 18}}{18} = \frac{120}{18} = \dots A$$

for D_1 and $D_2 \rightarrow$

$$T_{avg} =$$

$$T_{diode} =$$

for even Diode

$$\frac{V_m}{\pi R} = \frac{169.7}{\pi \cdot 18}$$

$$\frac{V_m}{\pi R}$$