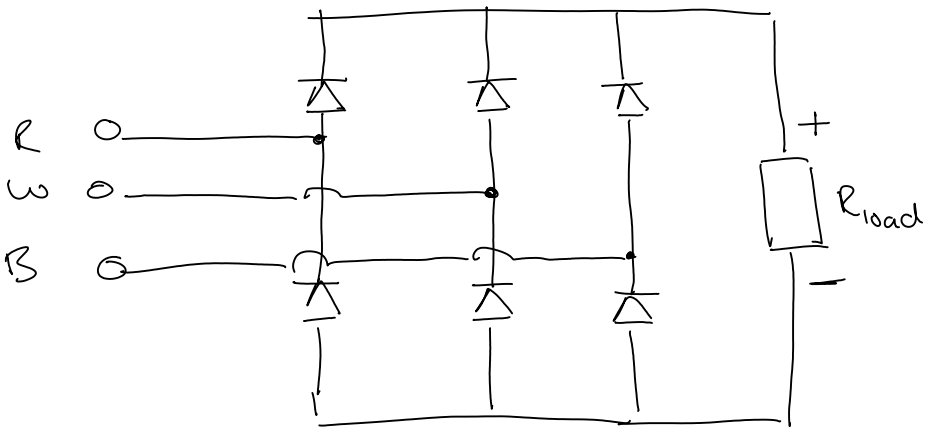
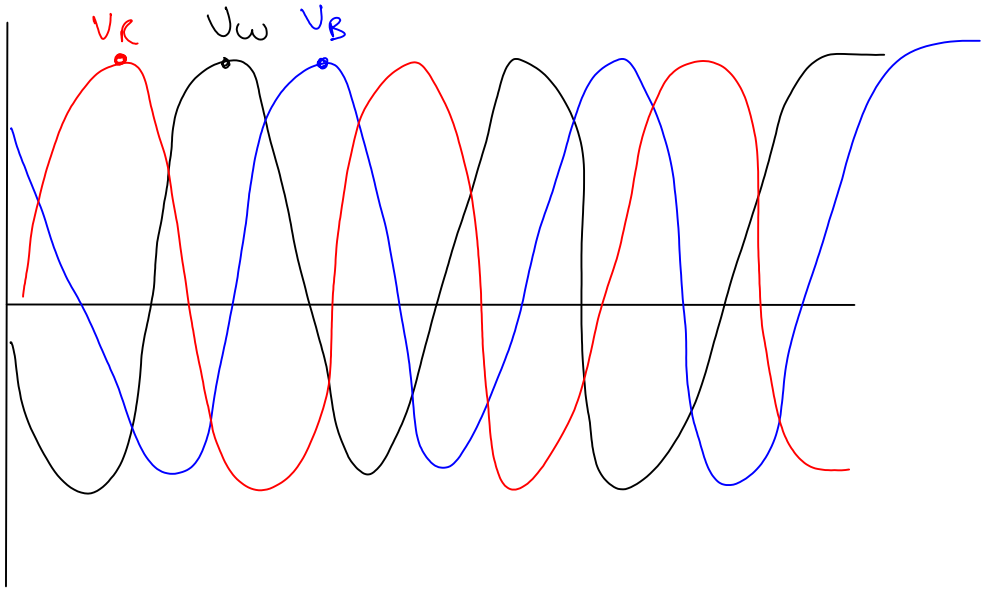
Lecture 18

Tuesday, 13 October 2009
4:53 PM

3 ϕ Full-wave Rectifier





$$V_r = V_m \sin \omega t$$

$$V_w = V_m \sin\left(\omega t - \frac{2\pi}{3}\right)$$

$$V_b = V_m \sin\left(\omega t - \frac{2\pi}{3}\right)$$

For $\frac{\pi}{6} \leq \omega t \leq \frac{\pi}{2}$

$$v_L = v_r - v_w$$
$$= \sqrt{3} V_m \sin\left(\omega t + \frac{\pi}{6}\right)$$

$$V_{AVE} = \frac{1}{\frac{\pi}{2} - \frac{\pi}{6}} \int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \sqrt{3} V_m \sin\left(\omega t + \frac{\pi}{6}\right)$$

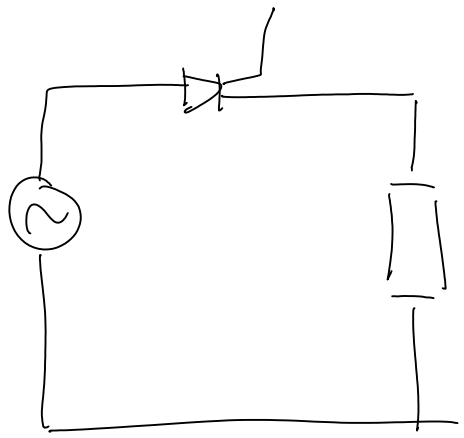
$$= \frac{6}{2\pi} \sqrt{3} V_m \left[-\cos\omega t + \frac{\pi}{6} \right]_{\frac{\pi}{6}}^{\frac{\pi}{2}}$$

$$= \frac{3\sqrt{3} V_m}{\pi} \left[-\left(\cos\frac{4\pi}{6} - \cos\frac{2\pi}{6} \right) \right]$$

$$= \frac{3\sqrt{3} V_m}{\pi} \left[-\left(-2\cos\frac{\pi}{3} \right) \right]$$

$$= \frac{3\sqrt{3} V_m}{\pi}$$

$\frac{1}{2}$ wave 1 ϕ controlled rectifier



$$V_{AVE} = V_{DC}$$

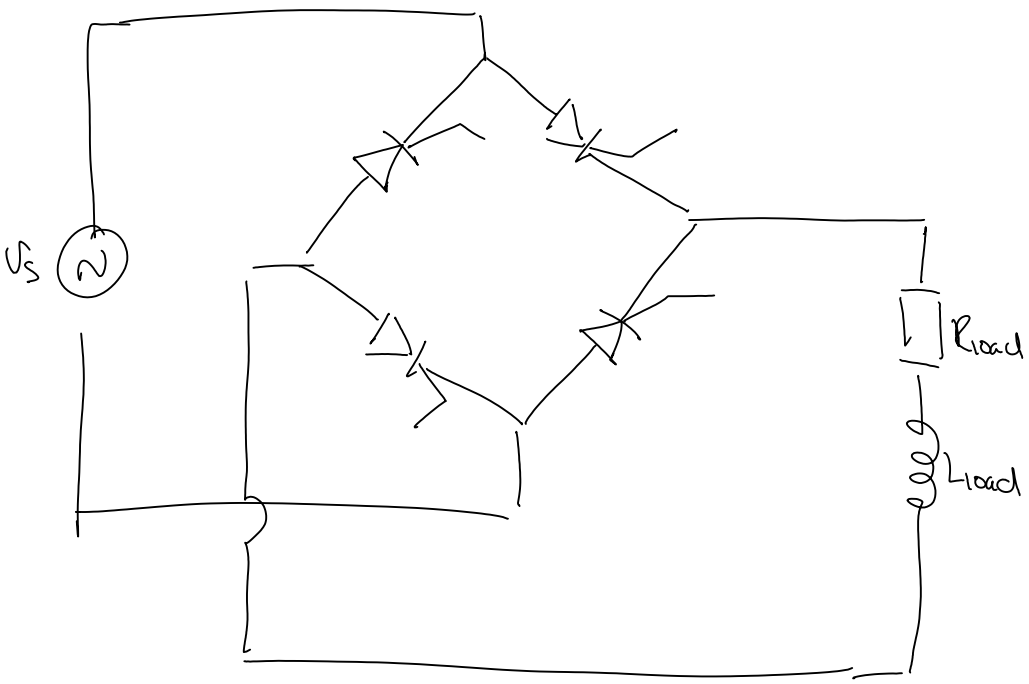
$$= \frac{1}{2\pi} \int_{\alpha}^{\pi} V_m \sin \omega t \; d(\omega t)$$

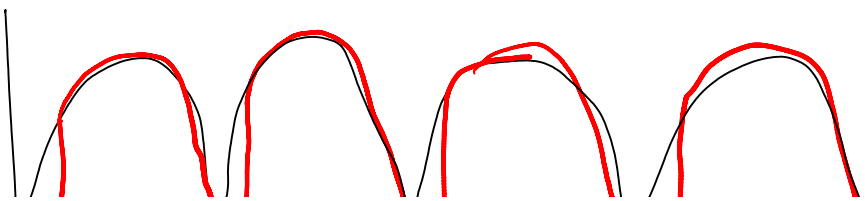
$$= \frac{V_m}{2\pi} \left[-\cos \omega t \right]_{\alpha}^{\pi}$$

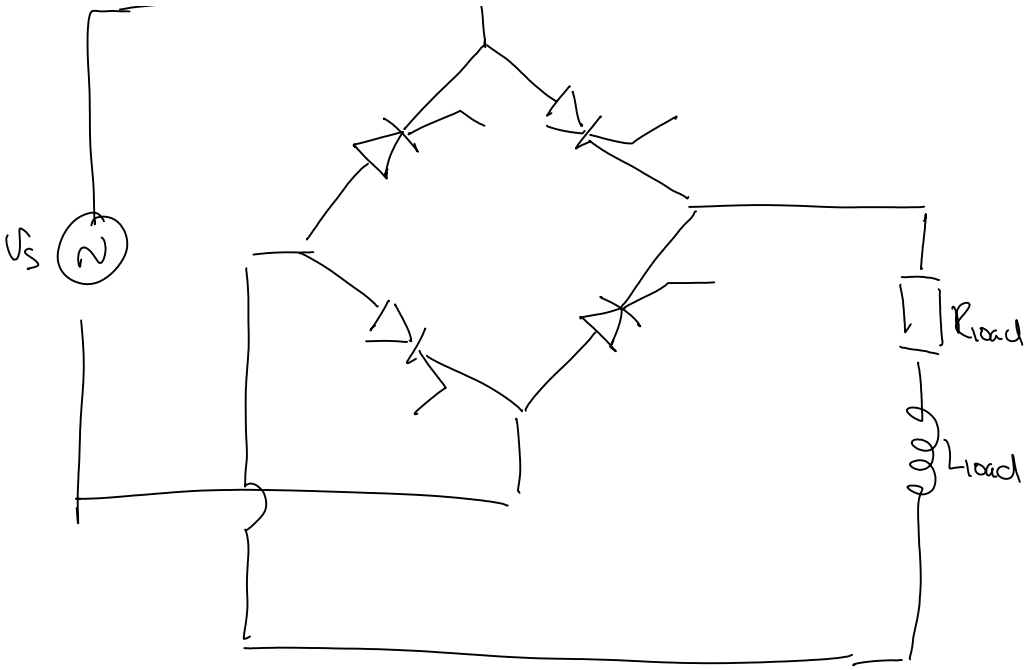
$$= \frac{V_m}{2\pi} - \left[-1 - \cos \alpha \right]$$

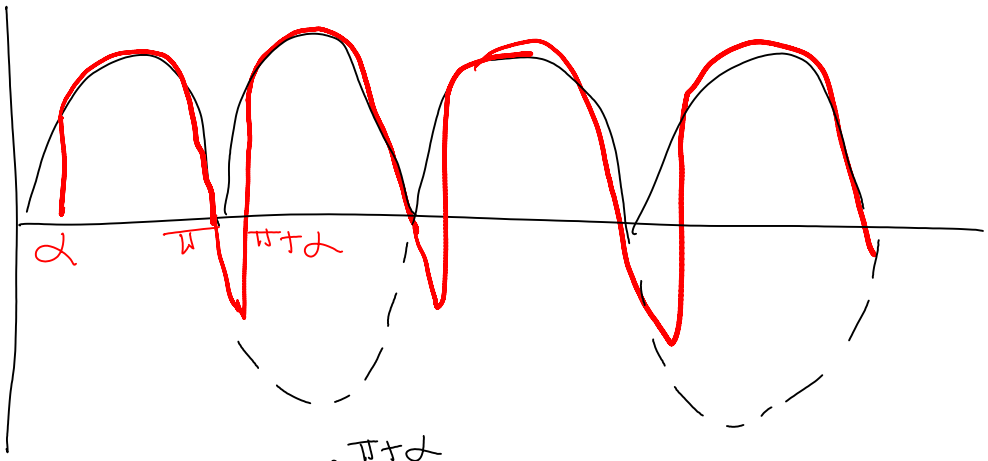
$$= \frac{V_m}{2\pi} \left[1 + \cos \alpha \right]$$

$$= \frac{\sqrt{2} V_{rms}}{2\pi} (1 + \cos \alpha)$$









$$V_{AVE} = \frac{1}{\pi}\int_{\alpha}^{\pi+\alpha} V_m \sin\omega t \; d(\omega t)$$

$$= \frac{V_m}{\pi}\left[-\cos\omega t\right]_{\alpha}^{\pi+\alpha}$$

$$= \frac{V_m}{\pi}\left[-\left(\cos(\pi+\alpha) - \cos\alpha\right)\right]$$

$$= \frac{V_m}{\pi}\left[-\left(-2\cos\alpha\right)\right]$$

$$2V_m$$

$$V_{AVE} = \frac{2V_m}{\pi} \cos\alpha$$

EXAM STRUCTURE

1. T/F	36m
2. IM	36m
3. DC m/C	36m
4. PE	36m
5. Sensors	36m