

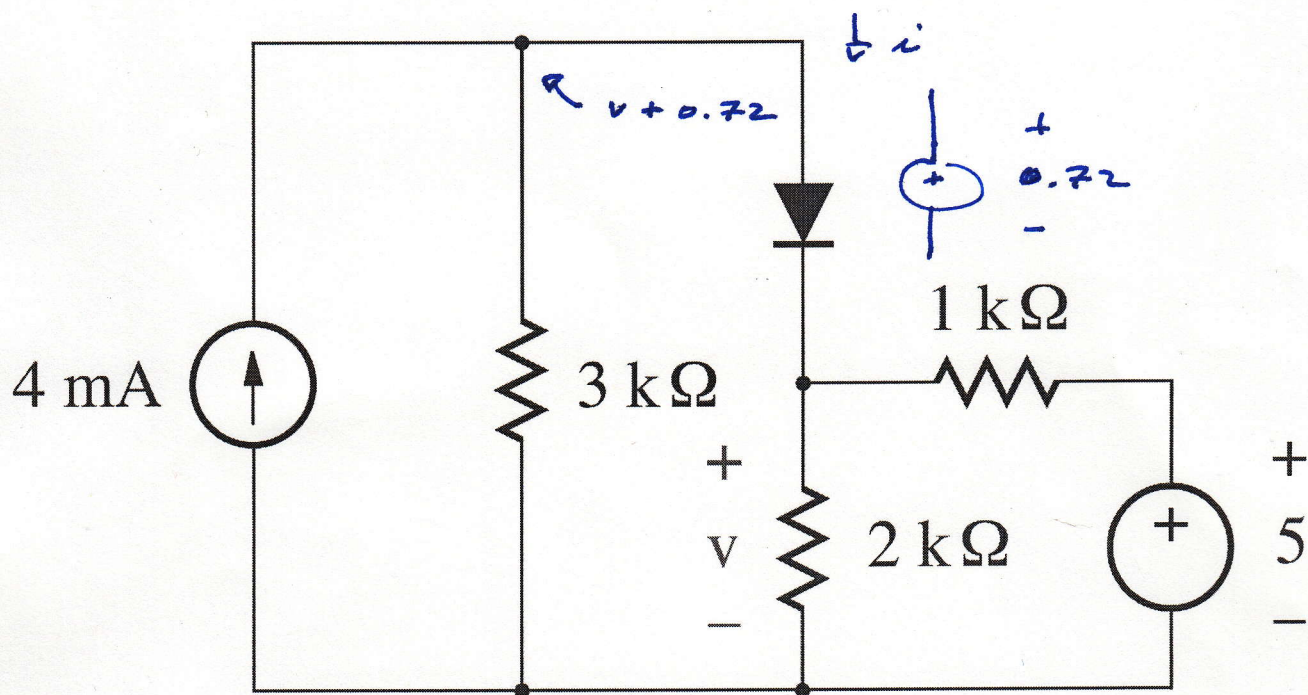
3.2.6

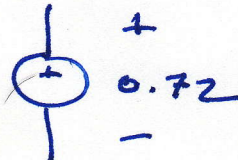
Diode is on.

a) Zero order $\rightarrow$  = short circuit

$$4 + \frac{5-v}{1} = \frac{v}{3/12}$$

$$9 - v = \frac{5v}{6} \rightarrow v = \frac{54}{11} = 4.909V$$



b) First order $\rightarrow$  = 

$$i = 4 + \frac{v + 0.72}{3}$$

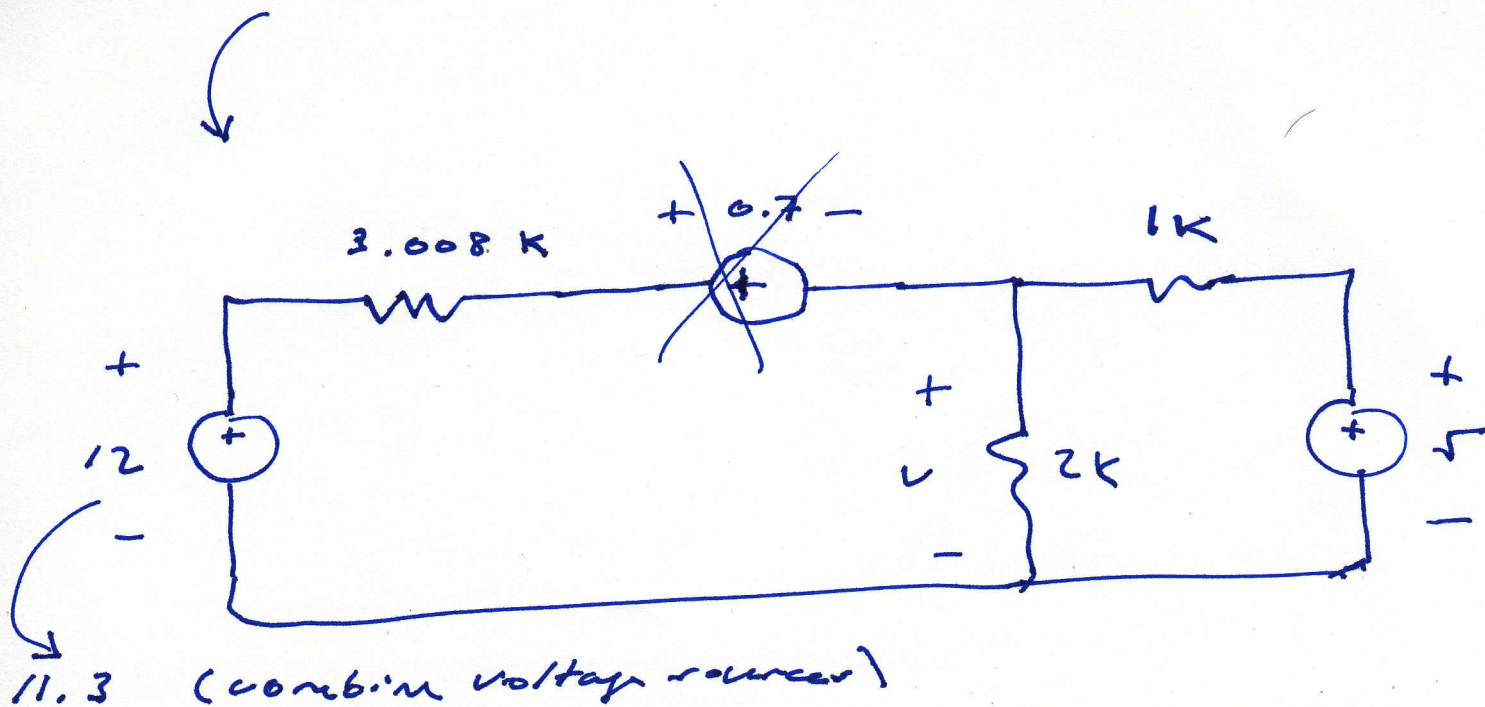
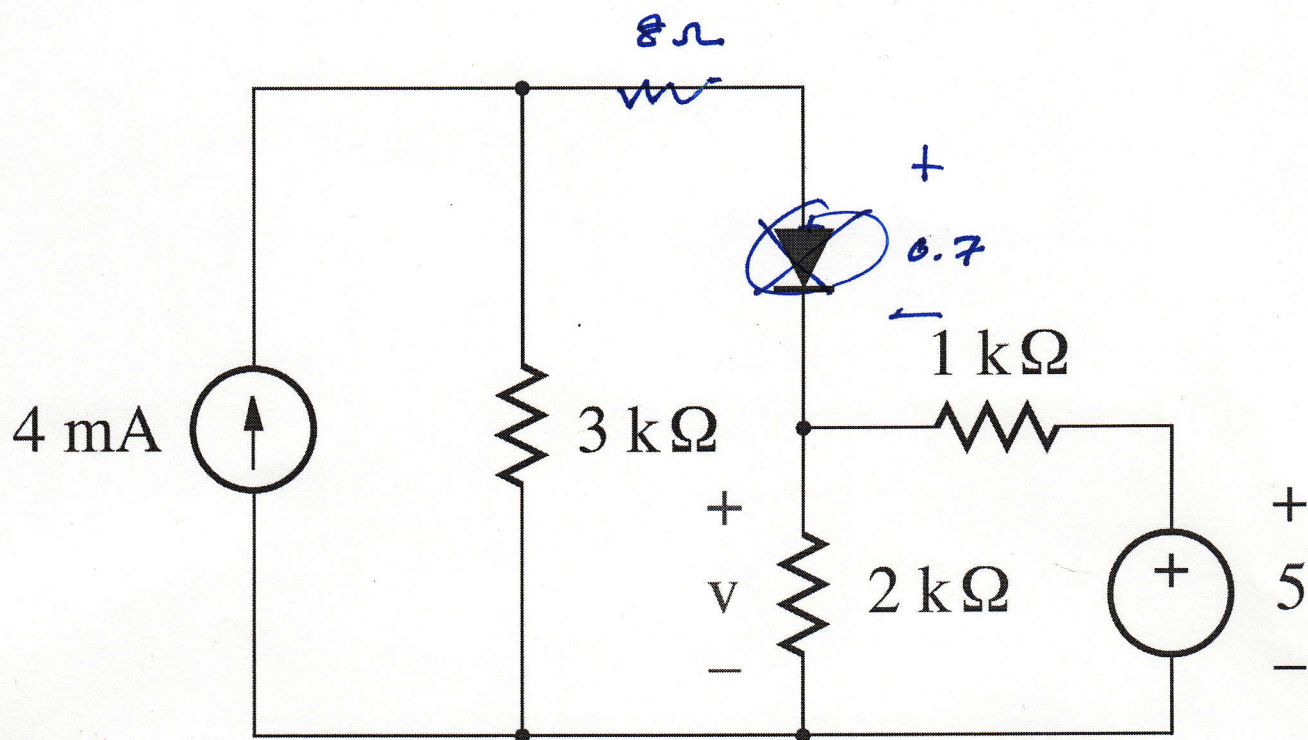
$$\rightarrow \frac{v}{2} = \frac{5-v}{1} + 4 - \frac{v + 0.72}{3}$$

$$\frac{11}{6} v = 9 - 0.24 \rightarrow v = 4.778V$$

3.26

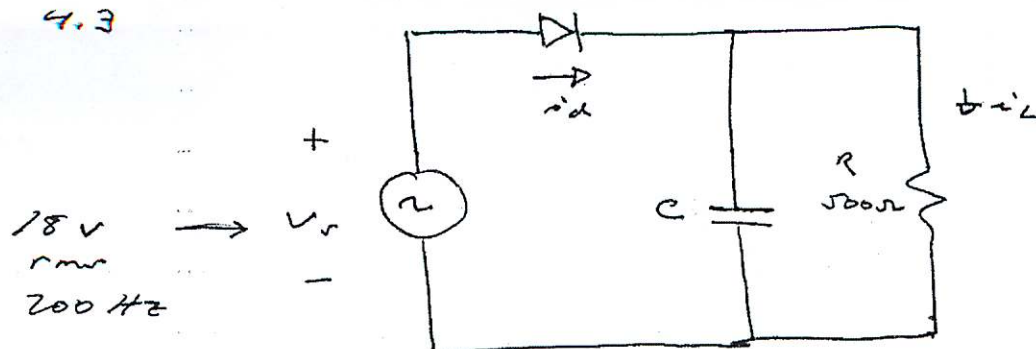
$$\frac{11.3 - v}{3.008} + \frac{5 - v}{1} = \frac{v}{2}$$

$$\rightarrow v = 4.780 \text{ V}$$



4.3

$$V_{\text{ripple}} = 0.6 \text{ V}$$



$$a) \quad v_s(\text{max}) = 18\sqrt{2} = 25.5 \text{ V}$$

$$i_L(\text{max}) = 25.5 / 0.5 = 51 \text{ mA}$$

$$b) \quad 1 - \frac{V_{\text{ripple}}}{V_{\text{max}}} = 0.976 = \cos \phi$$

$$\rightarrow \phi = 12.5^\circ = \omega \delta$$

$\underbrace{0.218 \text{ rad}} \quad \uparrow \text{ on time for diode}$

$$\delta = \frac{0.218 \text{ rad}}{200 \times 2\pi \text{ rad/s}} = 174 \text{ ns}$$

$$c) \quad i_d(\text{max}) = C V_{\text{max}} \omega \sin \phi$$

$$\frac{V_{\text{ripple}}}{V_{\text{max}}} = \frac{T}{RC}$$

$$C = \frac{T V_{\text{max}}}{R V_{\text{ripple}}} = \frac{1/200 \times 25.5}{500 \times 0.6} = 425 \mu\text{F}$$

$$i_d(\text{max}) = 425 \times 10^{-6} \times 25.5 \times 2\pi \times 200 \times \sin \phi$$

$$= 2.95 \text{ A}$$

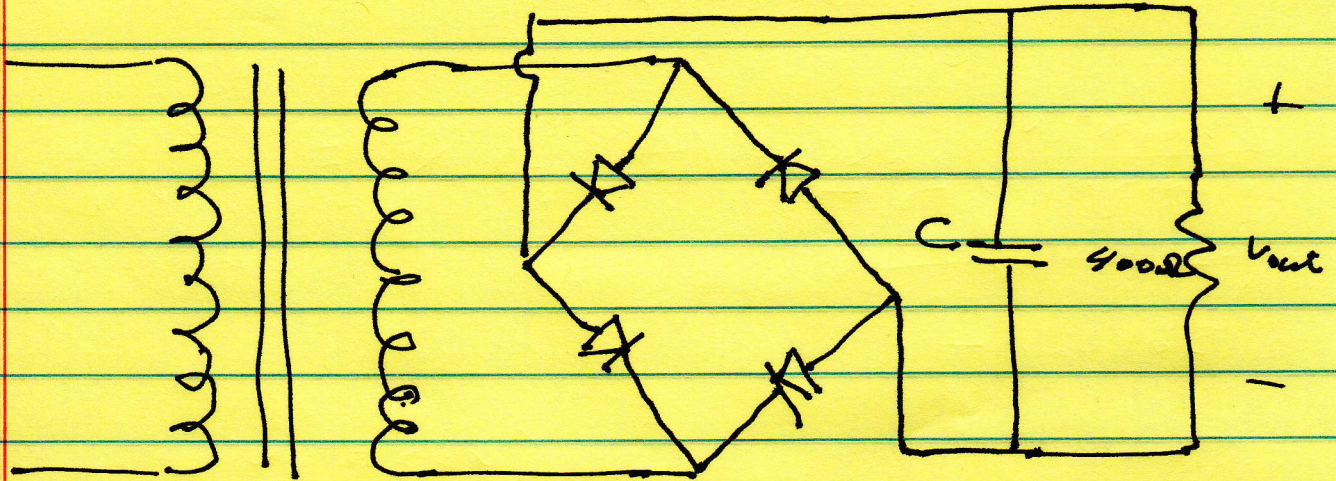
$$d) \quad \text{Peak reverse voltage} = \underline{36\sqrt{2} \text{ V}}$$

4.6

Full wave 60 Hz 115 V rms

50 mA to $400\Omega \rightarrow V_{out} = 20\text{ V}$

2% ripple $\rightarrow V_{ripple} = 0.4\text{ V}$



$N:1$

$$N = \frac{115\sqrt{2}}{20} = 8.1$$

$$\frac{V_{ripple}}{V_{max}} = 0.02 = \frac{r}{2nC}$$

$$C = \frac{1}{60 \times 2 \times 0.02 \times 400} = 1\text{ mF}$$

$$\frac{V_{ripple}}{V_{max}} = 0.02 = 1 - \cos\phi \rightarrow \phi = 11.5^\circ$$

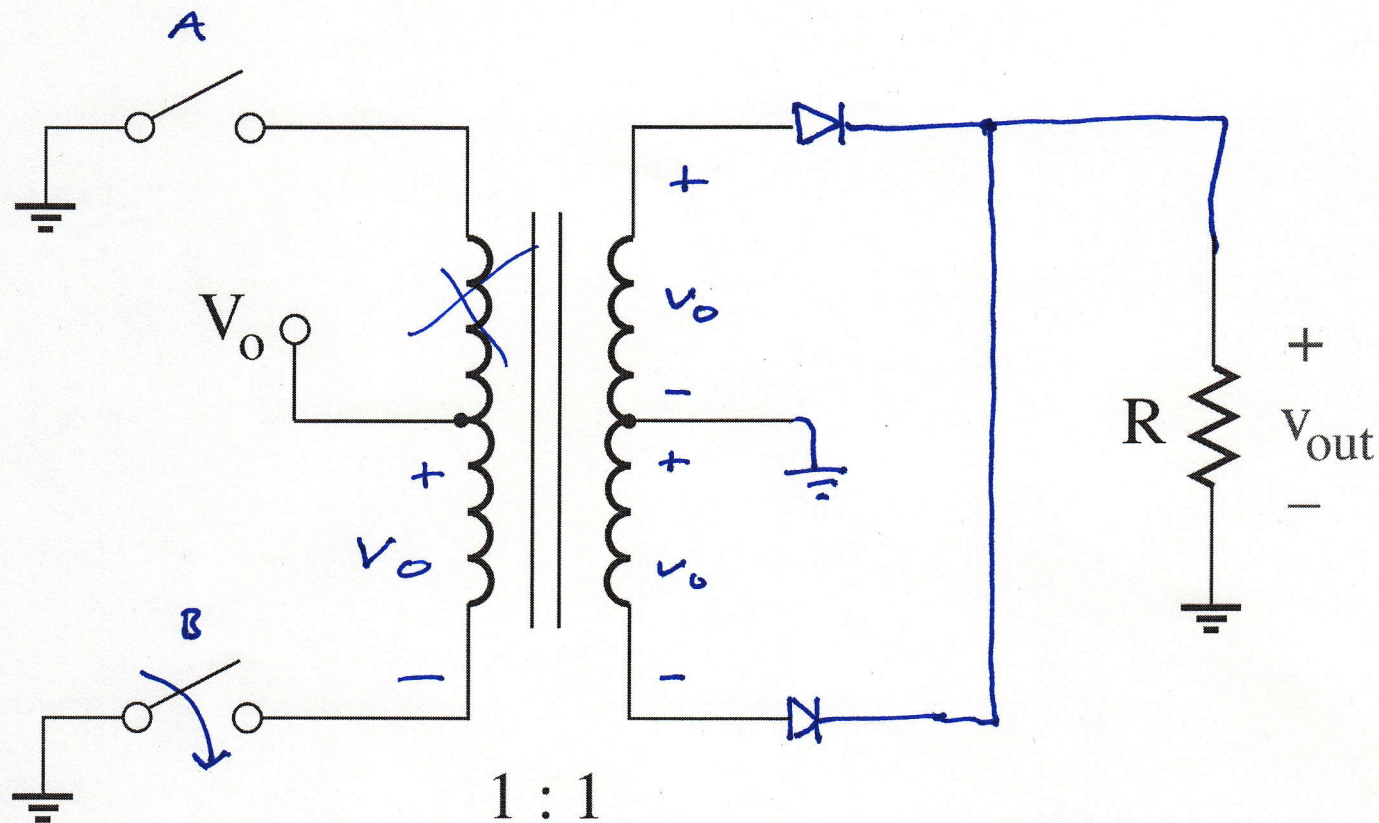
$$I_{diode\ max} = \omega C V_{out} \sin\phi$$

$$= 2\pi \times 60 \times 10^{-3} \times 20 \times 0.199$$

$$= 1.5\text{ mA}$$

$$\text{diode peak reverse voltage} = 20\text{ V}$$

4.11a

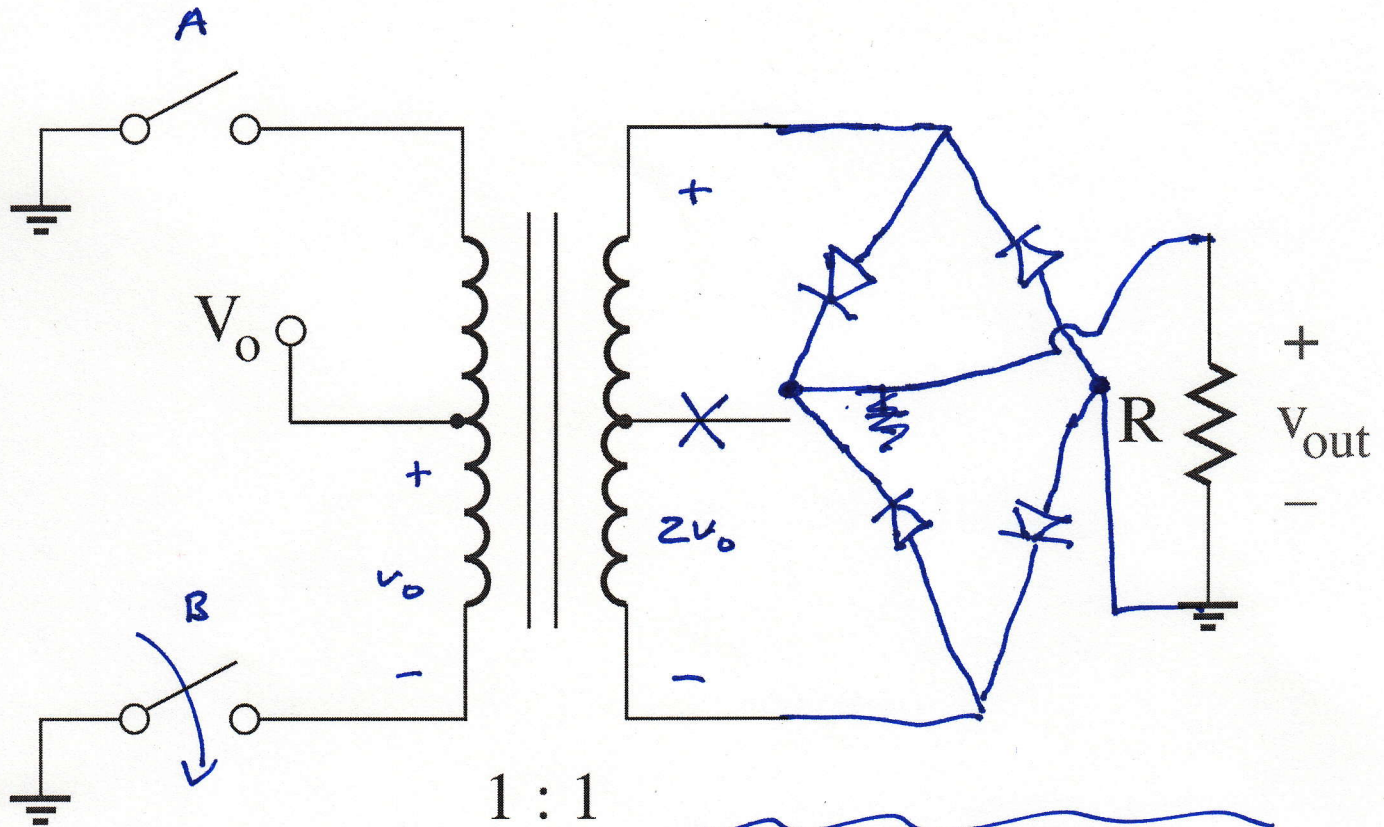


see Fig. 4.4b
in text.

voltages shown when switch B is closed

$$\rightarrow V_{out(max)} = V_o$$

4.11 b



voltage shown when switch b is closed

$$V_{out(max)} = 2V_o$$

c) voltage doubler for design b.