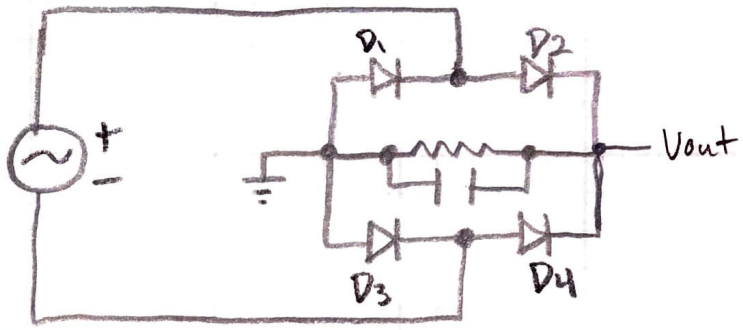
1.) 3V, 5A, 60Hz

$V_r = 10mV$

$V_{on} = 1V$

a.)



b.) $C = \frac{I_{DC} T}{2V_r} = \frac{5(1/60)}{2(10mV)} = \boxed{4.167F = C}$

$\Delta T = \frac{1}{\omega}\sqrt{\frac{2V_r}{V_p}} \Rightarrow 1.68 \times 10^{-4} s$

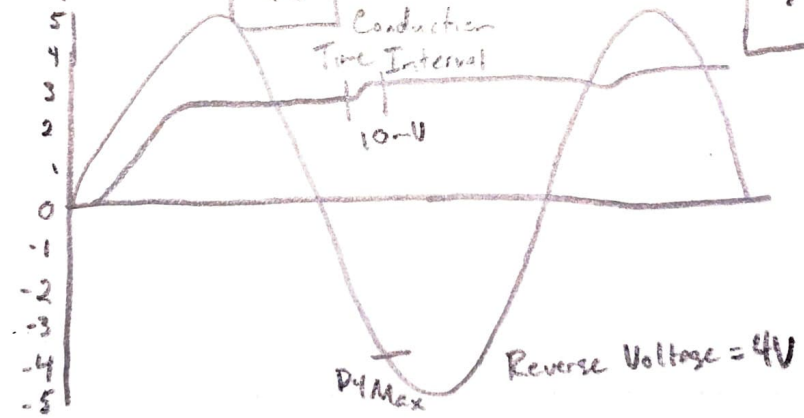
$I_p = I_{dc}\left(\frac{T}{\Delta T}\right) = 5\left(\frac{1/60}{1.68\times10^{-4}}\right) = \boxed{496.032 A}$

$V_p = V_{DC} + 2V_{on} = 5V$ $I_{surge} = \omega C V_p = 120\pi(4.167)(5)$

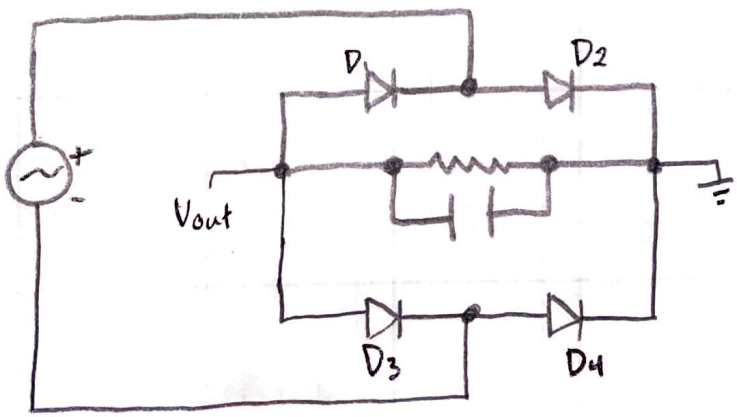
$\Rightarrow \boxed{7854.61 A}$

$PIV = V_p - V_{on} = \boxed{4V}$

c.)



d.)



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2.) a.) true
b.) true
c.) false
d.) true
e.) true
f.) true
g.) false
h.) false
i.) true
j.) true
k.) true

3.) a.) $V_f = 0V$

$n_{po} = \frac{10^{10}}{2\times10^{16}} = 5000$

$p_{no} = \frac{(10^{20})^2}{1\times10^{20}} = 1$

$e^0 = 1$

$n(-x_p) = \boxed{5000/cm^3}$

$p(-x_p) \simeq \boxed{2\times10^{16}/cm^3}$

$n(x_n) \simeq \boxed{1\times10^{20}/cm^3}$

$p(x_n) = 1e^0 = \boxed{1/cm^3}$

$\phi_{bi} = 0.0258 \ln\left(\frac{(1\times10^{20})(2\times10^{16})}{(10^{10})^2}\right) = 0.96839V$

$w_o = \sqrt{\frac{2(11.8\cdot8.85\times10^{-14})}{1.6\times10^{-19}}(0.96839)\left(\frac{1}{2\times10^{16}} + \frac{1}{1\times10^{20}}\right)}$

$\Rightarrow 0.25mm$

$E_{max} = \frac{2(0.96839)}{0.25\,mm} = \boxed{75.146\ KV/cm}$

b.) $\phi_{Total} = 0.96839$

$$\frac{1}{2}\frac{qN_d}{\epsilon_{si}}\left(\frac{2\epsilon_{si}\phi_{Total}}{qN_d\left(1+\frac{N_d}{N_i}\right)}\right) = \frac{\phi_{Total}}{1+\frac{N_d}{N_a}} = \boxed{1.94\times10^{-4}\ V\ (n\text{-side})}$$

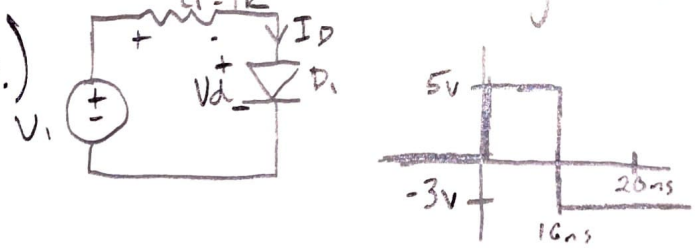
$$\frac{1.94\times10^{-4}}{0.96839} = \boxed{2\times10^{-4}}$$

c.) $N_a x_p = N_d x_n \rightarrow \frac{x_n}{x_p} = \frac{N_a}{N_d} = \frac{2\times10^{16}}{1\times10^{20}} = \boxed{2\times10^{-4}}$

4.) Depletion Capacitance increases. A large number of holes from p in are moved away.

5.) A Schottky diode has a lower turn on voltage, this helps it to gain faster switching speeds.

6.)



a.) $KVL = \frac{V_1 - V_D}{R_1} = \frac{5-0}{1K} \Rightarrow \boxed{I_D = 5mA}$

b.) $I_F = \frac{V_1 - V_{on}}{R} = \frac{5-0.7}{1K} = \boxed{4.30mA}$

$$I_R = \frac{V_1 - 0}{R} = \frac{5}{1K} = \boxed{5.00mA}$$

1.6ns

Storage time $= 8n\ln\left(1-\frac{4.3}{-5.0}\right) = \boxed{4.967\ ns}$