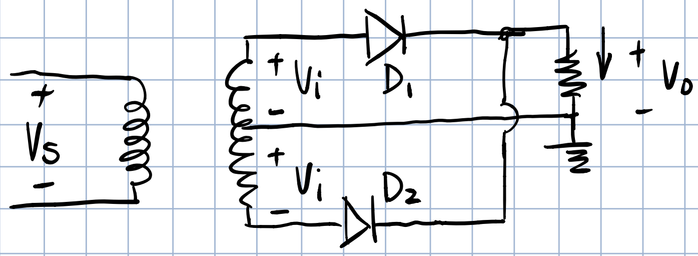
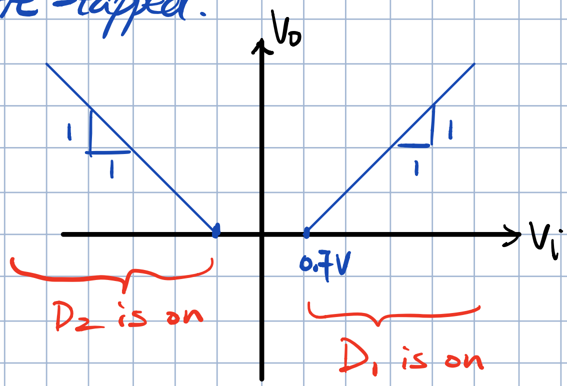
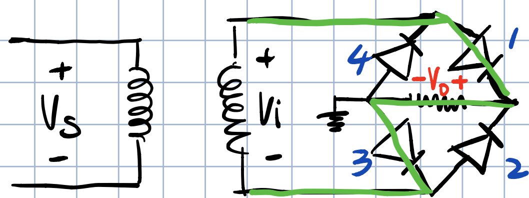
full wave rectifier w/ ~~capacitor~~ centre-tapped.

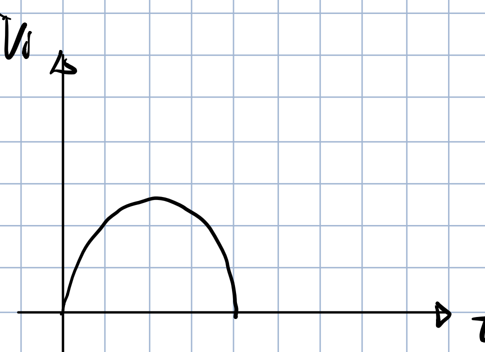




V_i -ve cycle. V_i +ve cycle.

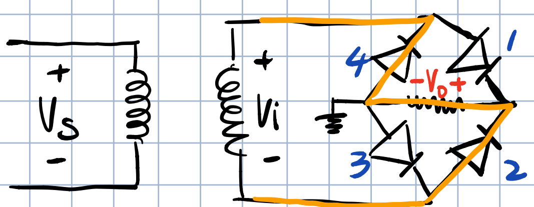
Bridge rectifier. (F.W.R)

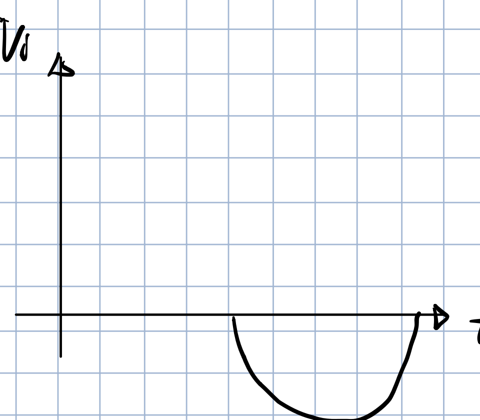




D_1, D_3 ON

D_2, D_4 OFF

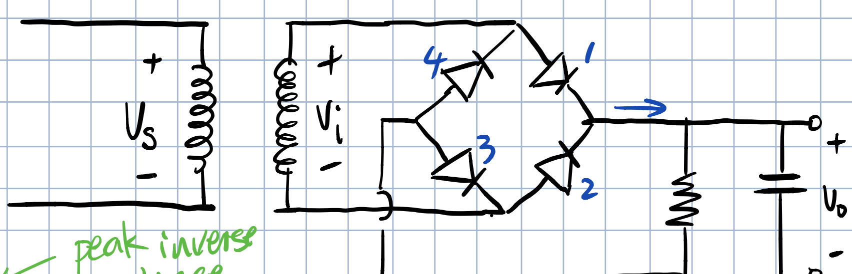


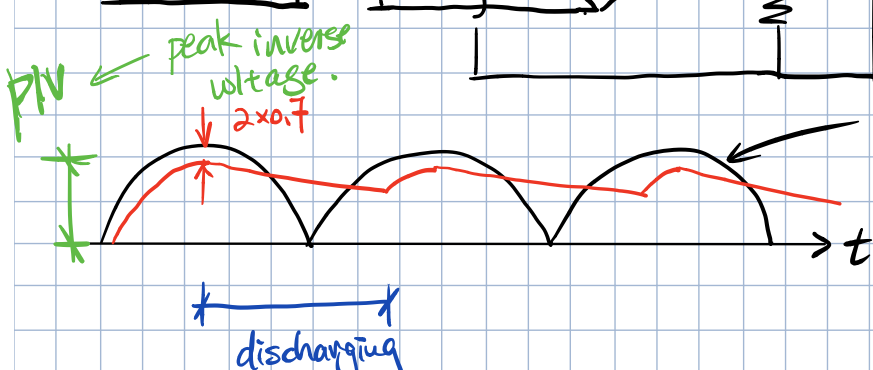


D_1, D_3 OFF

D_2, D_4 ON

Bridge rectifier. w/ capacitor.





w/o capacitor.

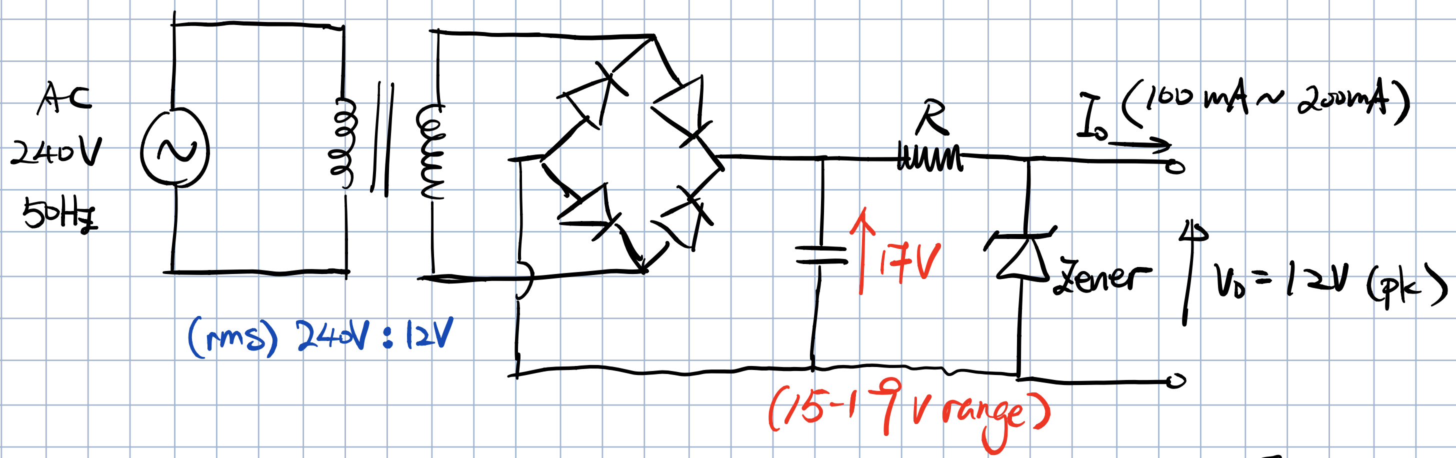
Compare to H.W.R. discharge time ≃ T/2 hence the ripple is reduced.

for H.W.R : $V_r \doteq \dfrac{V_p - 0.7}{fRC}$ for F.W.R. : $V_r \doteq \dfrac{V_p - 0.7 \times 2}{2fRC}$

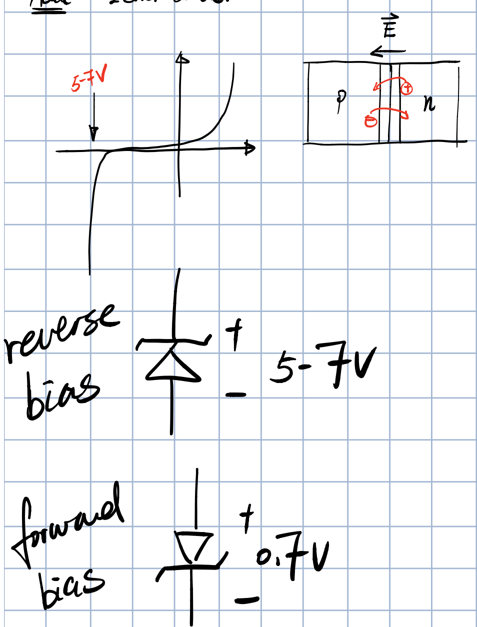
$i_{D_{max}} = i_L \left(1 + 2\pi\sqrt{2V_p/V_r}\right)$ $i_{D_{max}} = i_L \left(1 + 2\pi\sqrt{V_p/2V_r}\right)$

Design a unit that operates from a supply of 240V AC @ 50Hz. The unit is required to drive an appliance of a fairly constant input of 12V and takes a current in the range of 100mA to 200mA.

1) AC to DC conversion. 2) Voltage step down.



Aside: Zener diode.



$17V_{pk} \to 12V_{rms} = \dfrac{17}{\sqrt{2}}\,V$

$R = (15V - 12V)/(200mA) = 15\Omega$

lowest voltage highest current.

$P_R = V^2/R = \dfrac{(19-12)^2}{15} = 3.3W$

$P_{Zener} = VI = 12V \times \left(\dfrac{(19-12)}{15}\right)$ max. possible current, going through the diode.

$= 5.6W$