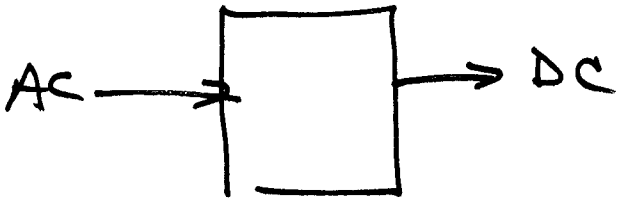
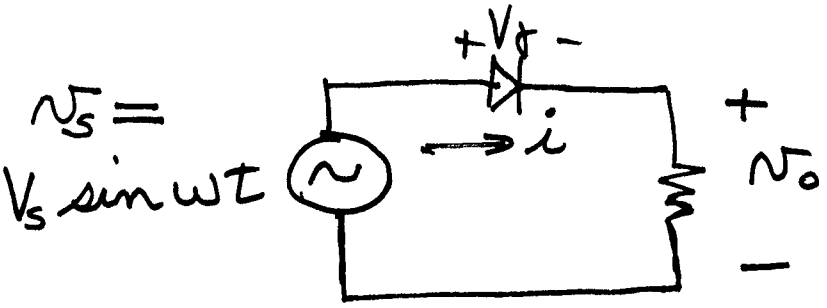
DIODE APPLICATIONS

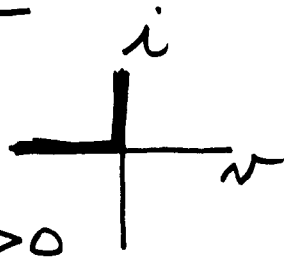
RECTIFIERS

AC TO DC CONVERTER





(1) IDEAL DIODE

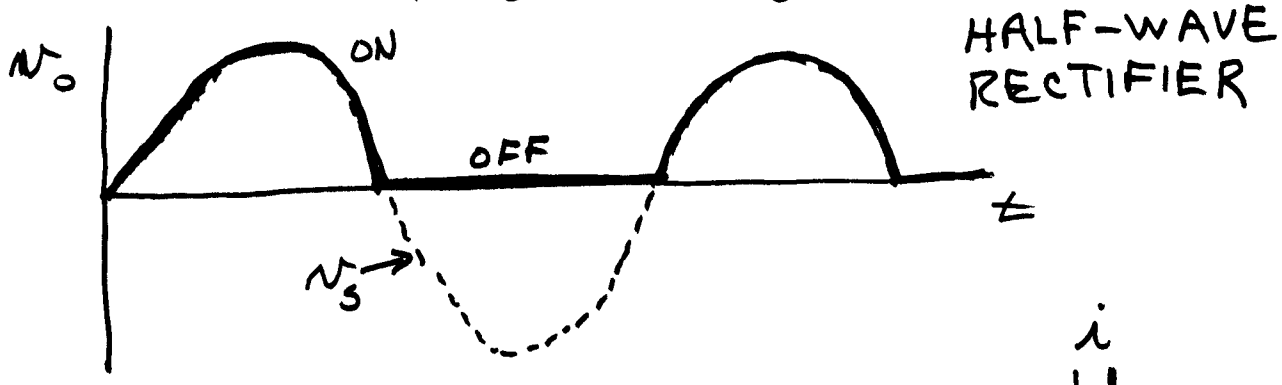


$V_\gamma = 0$ $r_f = 0$

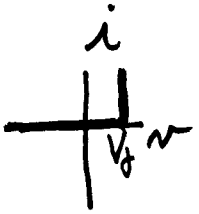
DIODE is ON for $v_s > 0$

$v_o = v_s = V_s \sin \omega t$

DIODE OFF, $v_s < 0$, $v_o = 0$

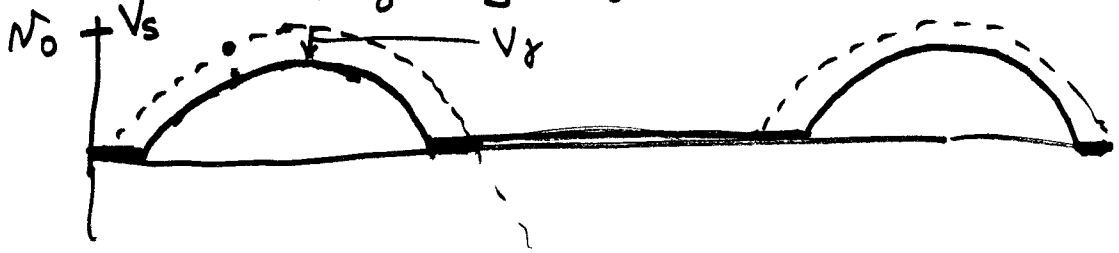


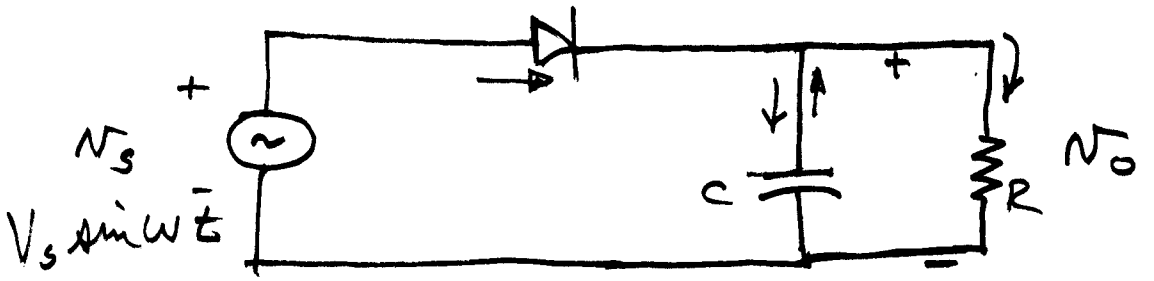
HALF-WAVE RECTIFIER

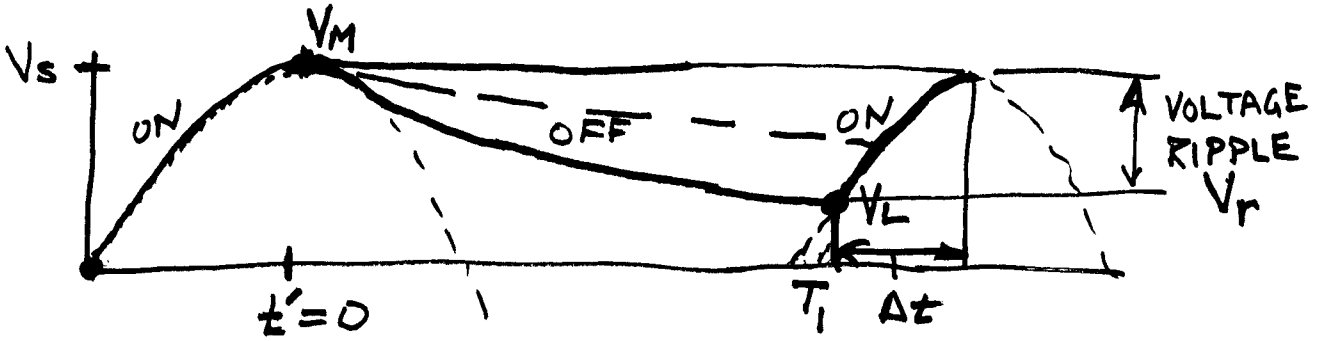


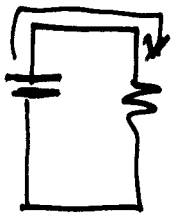
(2) V_γ DIODE ON for $v_s > V_\gamma$

$v_o = v_s - V_\gamma$









$v_o = V_1 e^{-t/RC}$

1 I.C.

$RC = \tau$

$$v_o = V_M e^{-t'/RC}$$

$$V_L = V_M e^{-T_1/RC}$$

DESIGN FOR $T_1 \ll RC$ (SMALL DECAY)
(SMALL V_r)

$$e^x = 1 + x + \frac{x^2}{2} \cdots$$

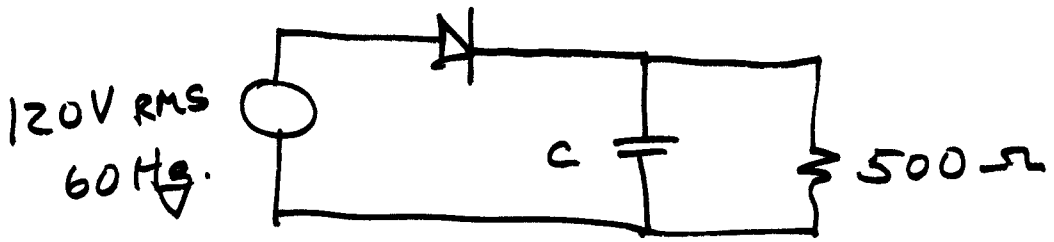
$$e^{-T_1/RC} \approx 1 - \frac{T_1}{RC}$$

$$V_r = V_M - V_L = V_M - V_M e^{-T_1/RC} = V_M\left(1 - e^{-T_1/RC}\right)$$

$$V_r \approx V_M\left[1 - \left(1 - \frac{T_1}{RC}\right)\right] = V_M\left(\frac{T_1}{RC}\right) \approx V_M\left(\frac{T}{RC}\right)$$

$T = \frac{1}{f}$

$$\boxed{V_r \doteq \frac{V_M}{RCf}}$$



FIND C SUCH THAT $V_r = 0.01 V_M$

1% RIPPLE

$$C = \frac{V_M}{R f V_r} = \frac{V_M}{R f (.01 V_M)} =$$

$$C = \frac{1}{(500)(60)(.01)} = 3333 \mu F$$