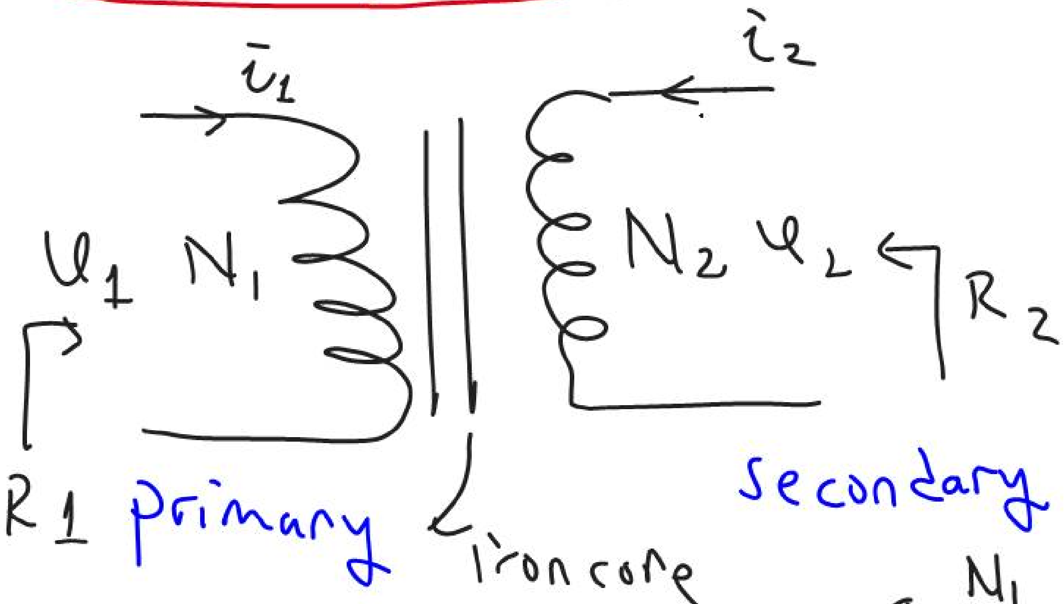
ECE 246

15.03.2014

©

RECTIFIERS

A Transformer:



$$a = \frac{N_1}{N_2} \quad \text{Turn Ratio}$$

$$\boxed{\frac{u_2}{u_1} = \frac{N_2}{N_1}}$$

$$\boxed{\frac{i_2}{i_1} = \frac{N_1}{N_2}}$$

$$\frac{\frac{u_2}{u_1}}{\frac{i_2}{i_1}} = \frac{\frac{N_2}{N_1}}{\frac{N_1}{N_2}}$$

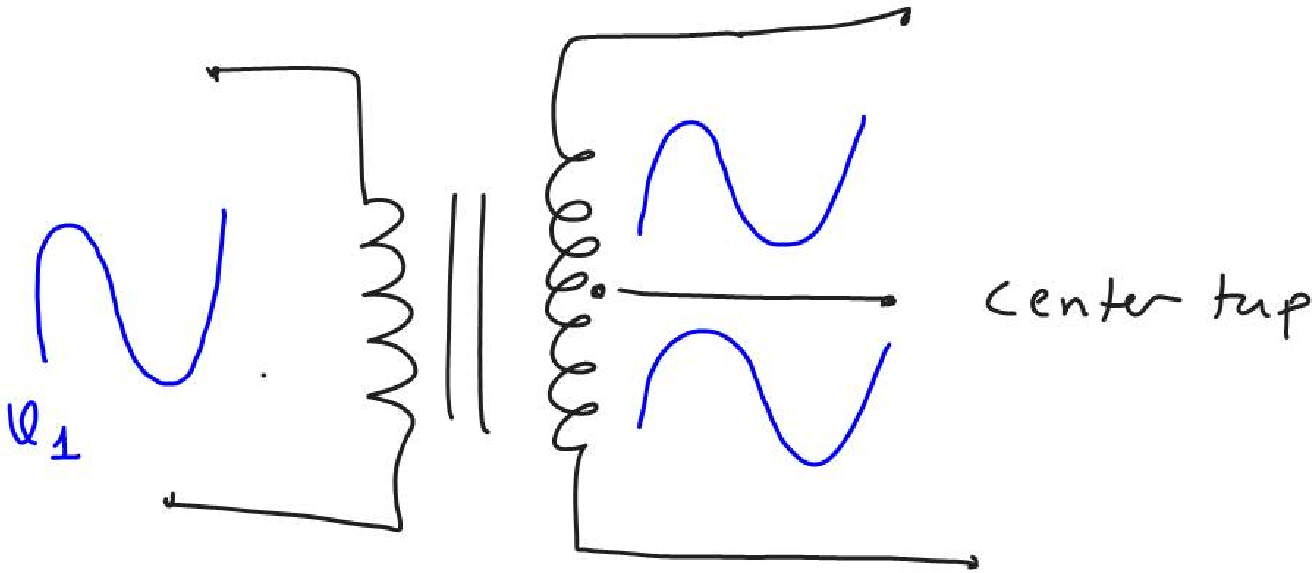
$$\frac{u_2}{u_1} \cdot \frac{i_1}{i_2} = \frac{N_2^2}{N_1^2}$$

$$\frac{u_2}{i_2} \cdot \frac{i_1}{u_1} = \left(\frac{N_2}{N_1}\right)^2$$

$$R_2 \cdot \frac{1}{R_1} = \left(\frac{N_2}{N_1}\right)^2$$

$$\boxed{R_2 = \left(\frac{N_2}{N_1}\right)^2 \cdot R_1}$$

CENTER-TAPPED TRANSFORMER:

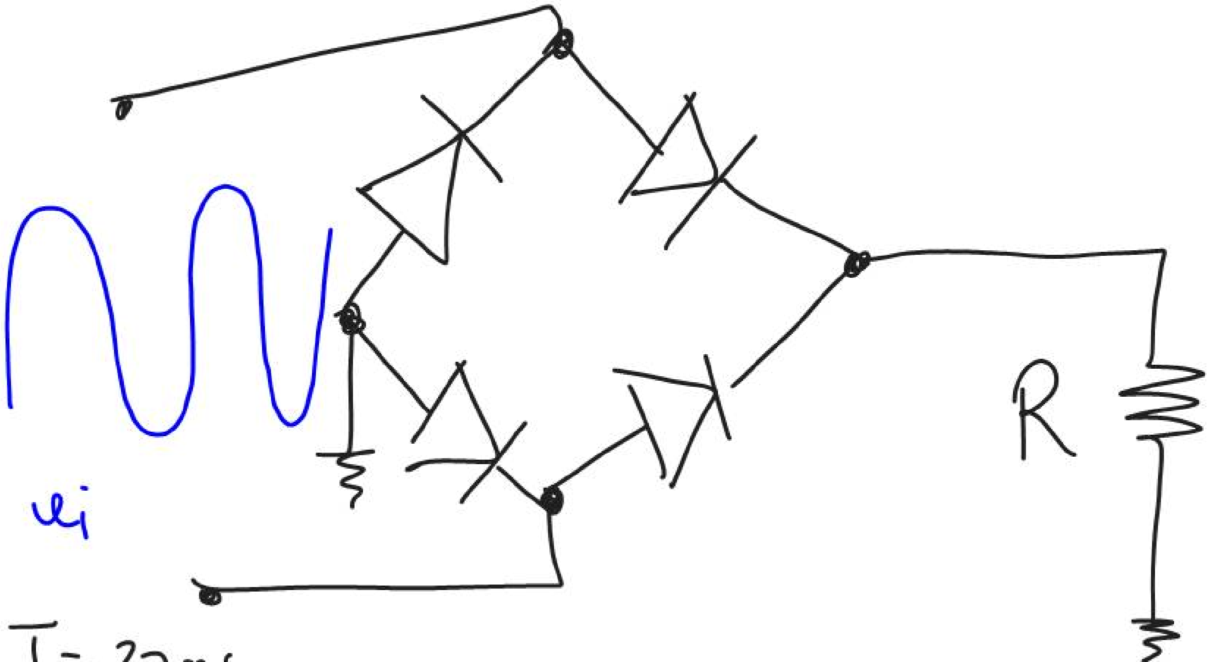


facilitate

sacrifice

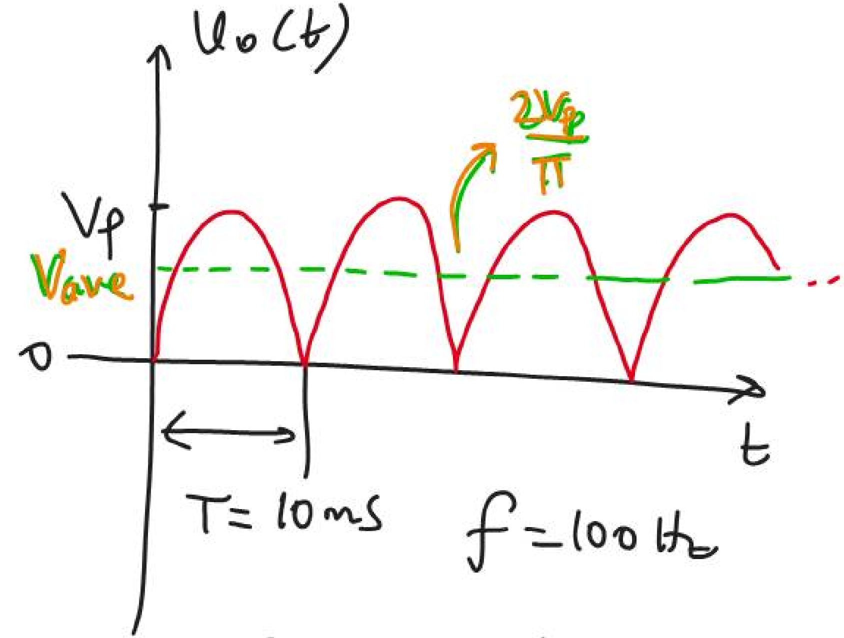
a compromise

a trade-off



T = 20ms

f = 50 Hz

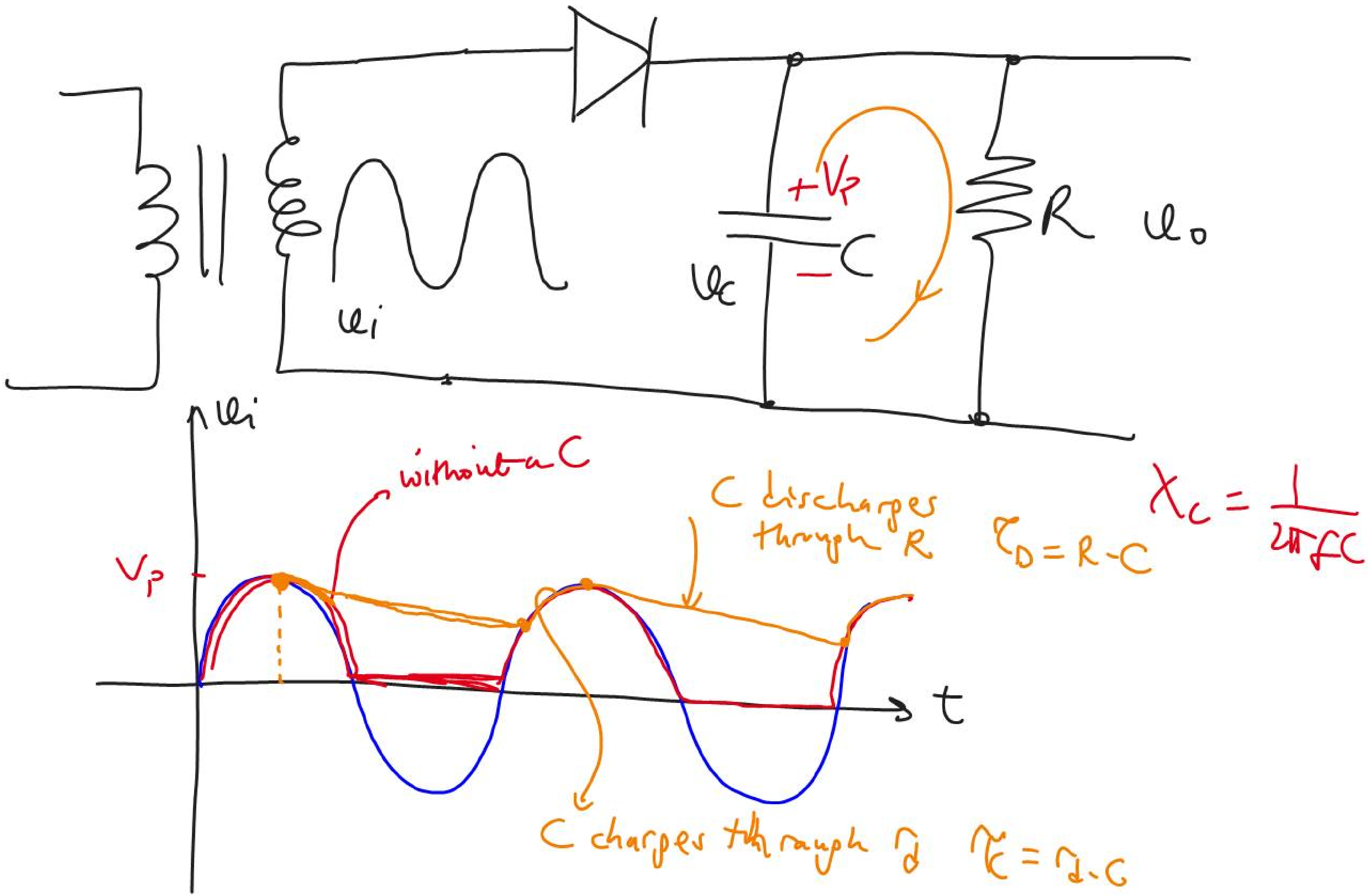


T = 10ms f = 100 Hz

Ripple ~ Vp

We want to minimize Ripple

How ?



$+V_P$
$-$
C
R
v_i
v_C
v_o
v_i
without a C
C discharges through R
$\tau_D = R \cdot C$
$X_C = \frac{1}{2\pi f C}$
V_P
t
C charges through r_d
$\tau_C = r_d \cdot C$

REGULATION

with Zener Diode

a) Line Regulation

b) Load Regulation

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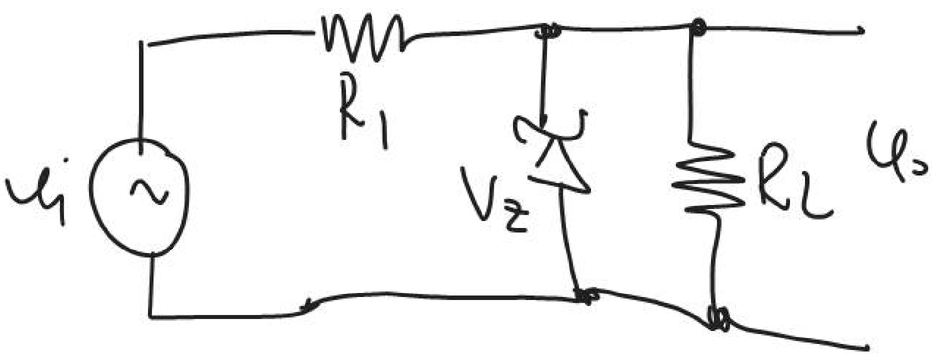
a) LINE REGULATION



Condition:

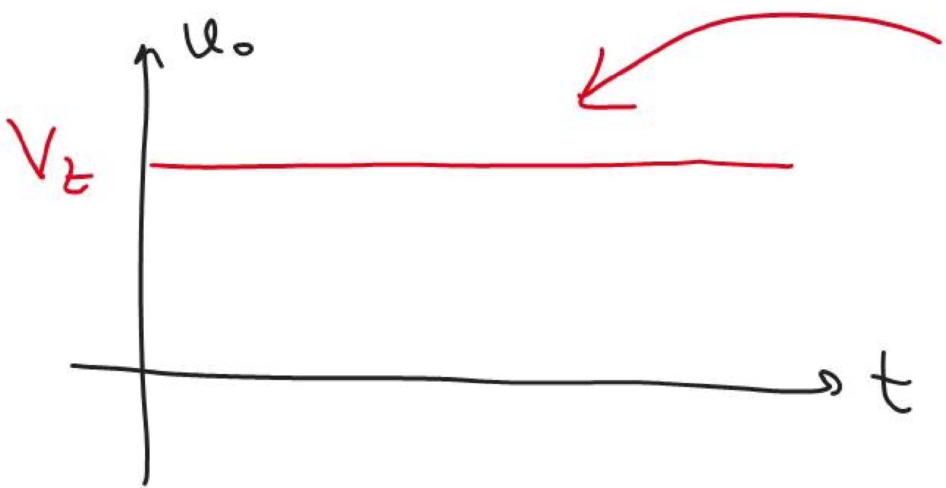
$$\frac{v_i}{R_1+R_L} \cdot R_L \geq V_z$$

$$\frac{v_{i\,min}}{R_1+R_L} \cdot R_L = V_z$$

$$v_{min} \cdot R_L = V_Z \cdot (R_1 + R_L)$$

$$V_Z = v_{imin} \cdot \frac{R_L}{R_1 + R_L} \Rightarrow \boxed{v_{imin} = V_Z \cdot \frac{R_1 + R_L}{R_L}} \; *$$

If this condition is satisfied then $v_o = V_Z$



to cease