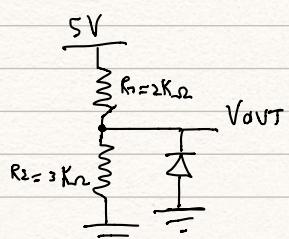
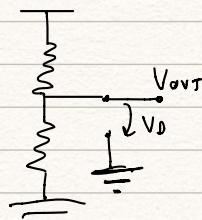


esercizio 1:



IPOTESI 2: IL DIODO SPENTO:

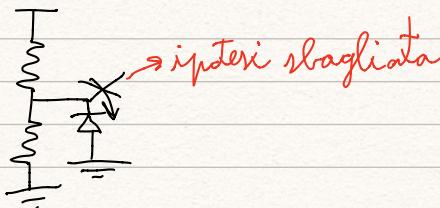
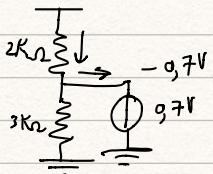


$$V_{OUT} = \frac{1}{2} \cdot \frac{5V \cdot 3k\Omega}{3k\Omega + 2k\Omega} = 3V$$

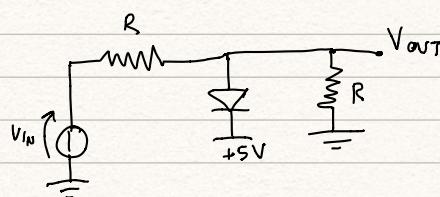
$$V_D = 0 - 3V = -3V$$

IPOTESI 2:

DIODO ACCESO

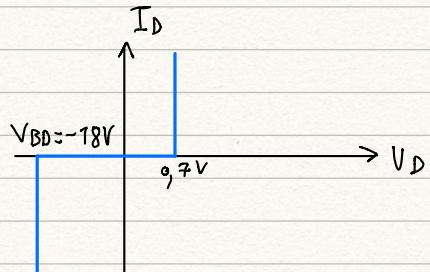


esercizio 2:



$$R = 5k\Omega$$

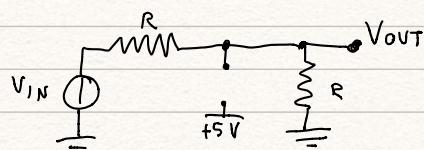
$$V_{BD} = -18V$$



1) Caratteristica statica $V_{OUT} = f(V_{IN})$

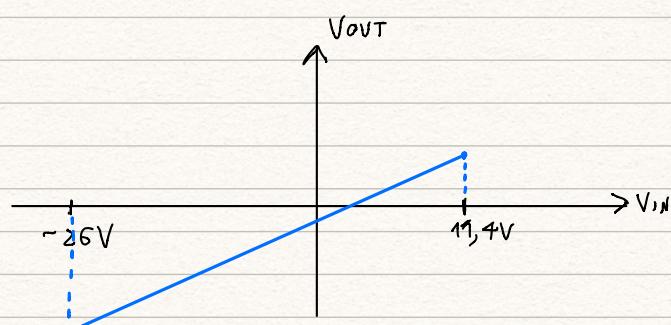
HP diodo spento
HP è verificata se

$$-18V < V_D < 0.7V$$



$$V_D = V_{OUT} - 5V \quad \text{con diodo spento}$$

$$V_{OUT} = V_{IN} \cdot \frac{R}{2R} = \frac{V_{IN}}{2}$$



$$-18V < V_D < 0.7V$$

$$-18V < V_{OUT} - 5V < 0.7V$$

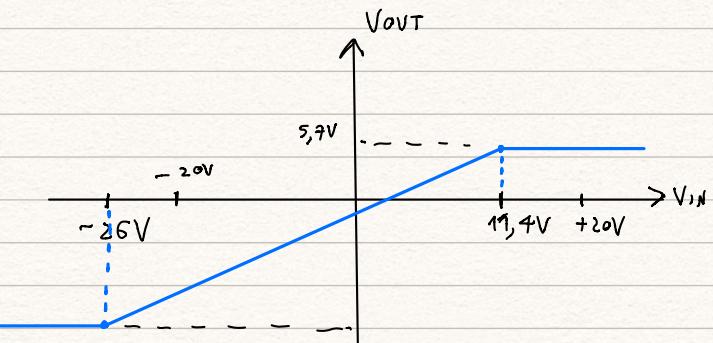
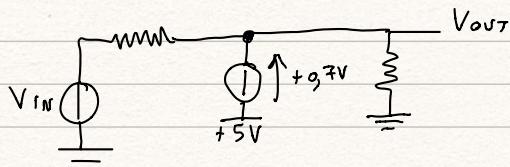
$$-18V < \frac{V_{IN}}{2} - 5V < 0.7V$$

DIODO SPENTO

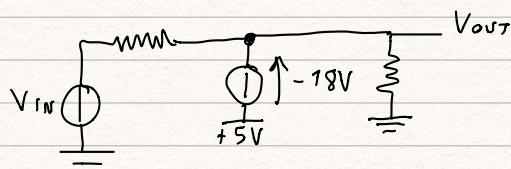
$$V_{IN} < 11.4V$$

$$V_{IN} > -26V$$

per $V_{IN} > 11,4V$ il diodo è acceso in DIRETSA



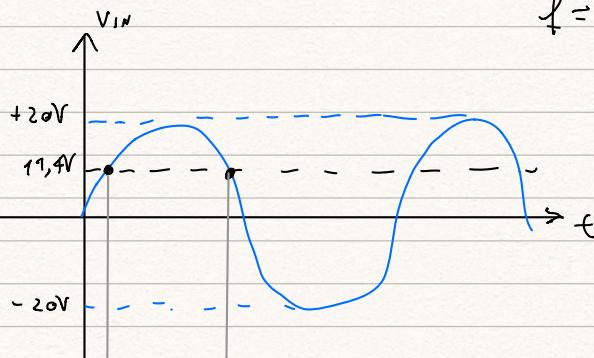
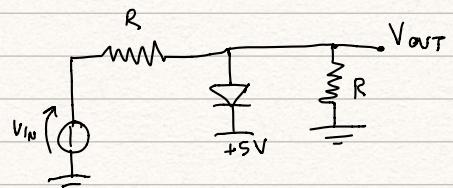
per $V_{IN} < -20V$



2) Sia $V_{IN} = V_0 \sin(2\pi f t)$

$$V_0 = 20V$$

$$f = 50Hz$$



$$\text{per } V_{IN}(t) < 11,4V \quad V_{OUT} = \frac{V_{IN}(t)}{2}$$

$$\text{Per } V_{IN}(t) > 11,4V \quad V_{OUT} = +5,7V$$

tale che $V_{IN}(t_1) = 11,4V$

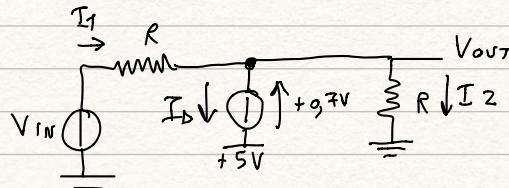
$$20V \sin(2\pi f t_1) = 11,4V$$

$$t_1 = 1,93ms$$

3) P_{MAX} dissipata dal diodo con $V_{IN} = 20V \sin(2\pi f t)$

$$P_D = V_D \cdot I_D$$

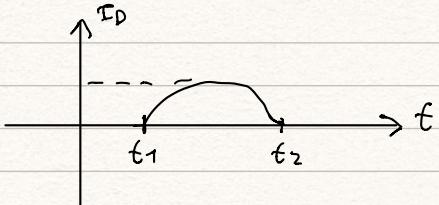
$$I_D = I_1 - I_2$$



$$I_1 = \frac{V_{IN}(t) - V_{OUT}(t)}{R} = \frac{V_{IN}}{R} - \frac{5,7V}{R}$$

$$I_2 = \frac{V_{OUT}(t)}{R} = \frac{5,7V}{R}$$

$$I_D = \frac{V_{IN}}{R} - \frac{5,7V}{R} - \frac{5,7V}{R}$$

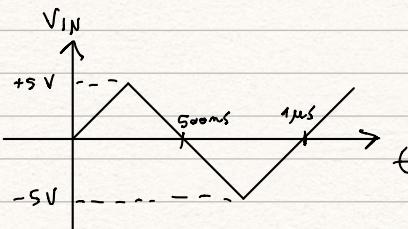
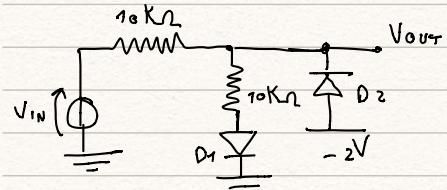


$I_{D\max}$ si ha per $V_{IN}(t)$ max

$$I_{D\max} = \frac{20 - 11,4V}{R} = \frac{8,6V}{R} = 1,72mA$$

$$P_{D\max} = 0,7V \cdot 1,72mA = 1,204W$$

esercizio 3:

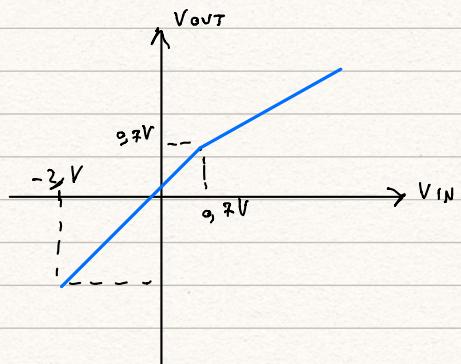
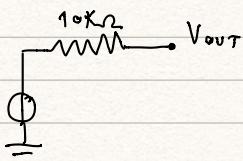


1) Tracciare su un grafico $V_{OUT}(t)$

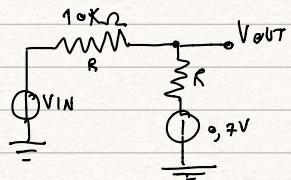
D_2 è spento per $V_{OUT} > -2,7V$
 D_1 è spento per $V_{OUT} < 0,7V$

-3,7V	D_1 off D_2 on
0,7V	D_1 on D_2 off

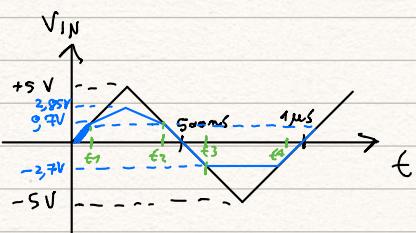
se entrambi i diodi sono spenti



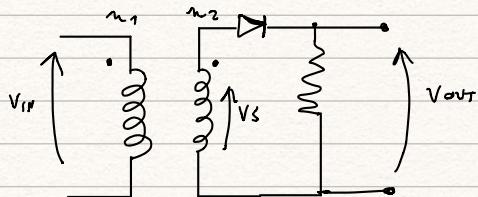
se solo D_1 è acceso:



$$V_{OUT} = \frac{R}{2R} (V_{IN} - 0,7V) + 0,7V$$



esercizio 4:



$$V_{IN} = 220 \sqrt{1} V \sin(2\pi f t) \quad \text{con } f = 50 \text{ Hz} \quad R = 1k\Omega$$

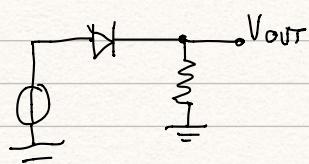
1) Dimensionare $\frac{n_1}{n_2}$ per avere $V_{S\max} = 72V$

$$\frac{V_{IN}}{m_1} = \frac{V_S}{m_2}$$

$$V_S = V_{IN} \cdot \frac{m_2}{m_1}$$

$$V_{S\text{MAX}} = V_{IN\text{MAX}} \cdot \frac{m_2}{m_1} = 12V \rightarrow \frac{m_1}{m_2} = 26$$

circuito equivalente per analizzare

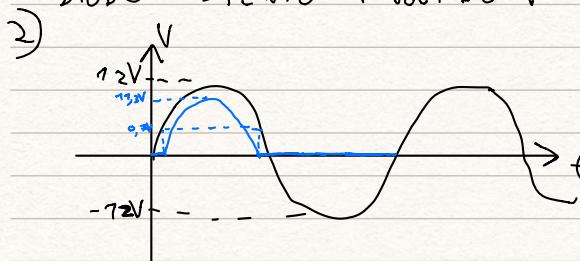


$$V_S = 12V \sin(2\pi f t) \quad f = 50\text{Hz}$$

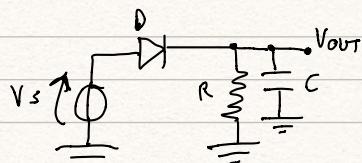
Il diodo si accende per $V_S(t) > 0,7V$

DIO^O ACCESO $\rightarrow V_{OUT} = V_S - 0,7V$

DIO^O SPENTO $\rightarrow V_{OUT} = 0V$

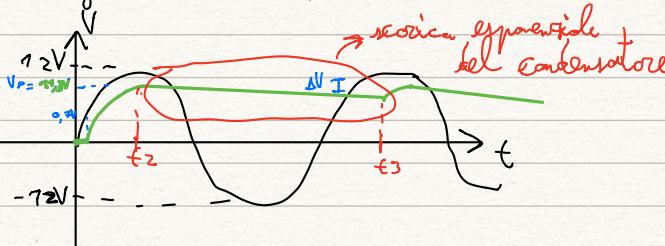


3) Aggiungere C parallelo ad R tale che $RC \gg T$ ($T = \frac{\pi}{f}$)



$$I_C = C \frac{dV_C}{dt}$$

dileguire $V_{OUT}(t)$



per $V_S(t_2^+) = 12V$ il diodo si spegne

$$V_C(t_3) = 11,3V$$

questo circuito è un RADDRIZZATORE A SINGOLA SEMIONDA

$$\text{ripple} = \frac{\Delta V}{V_{P\text{icco}}}$$

4) dimensionare C per avere un ripple $< 1\%$
con diodo spento

$$V_{OUT} = V_{P\text{icco}} e^{-\frac{t}{RC}}$$

$$V_{OUT}(t_3) = ?$$

$$\Delta V_{\text{MAX}} = V_{OUT}(t_3) - V_P$$

(\rightarrow approssimiamo $V_{OUT}(t_3)$ con $V_{OUT}(T)$ [conservativo!])

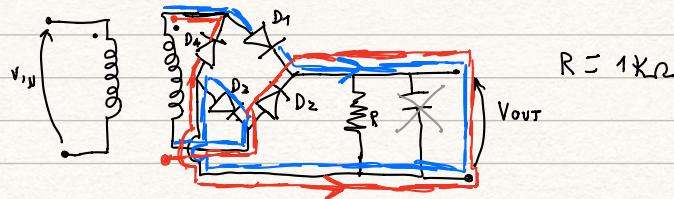
$$V_{OUT} = V_P \cdot e^{\frac{t}{RC}} \approx V_P \left(1 - \frac{t}{RC}\right)$$

$$\Delta V \approx V_P - \left[V_P \left(1 - \frac{T}{RC}\right) \right] = V_P \cdot \frac{T}{RC}$$

$$\frac{\Delta V}{V_P} < 1\% \quad \frac{T}{RC} < 0,01$$

$$C > \frac{20 \text{ ms}}{1 \text{ k}\Omega \cdot 0,01} = 2 \text{ mF}$$

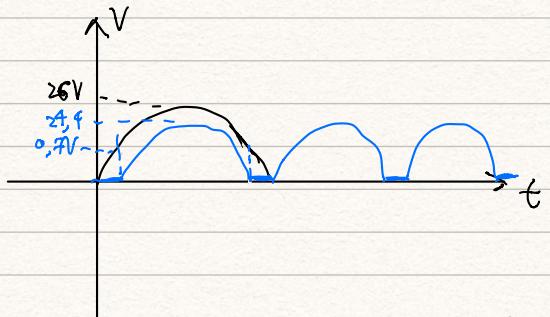
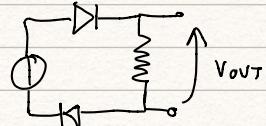
RADDIZZATORE A DOPPIA SENNDA:



$$V_S = 2,5 \text{ V} \sin(2\pi f t)$$

1) Tracciare $V_{OUT}(t)$ senza considerare la capacità C

per V_S positivo D_4 spento, D_2 acceso



I diodi si accendono per $V_S > 1,4 \text{ V}$

con diodi accesi $V_{OUT} = V_S - 1,4 \text{ V}$

con diodi spenti $V_{OUT} = 0 \text{ V}$

Tenendo conto del condensatore

per V_S NEGATIVO

D_1, D_3 spenti

