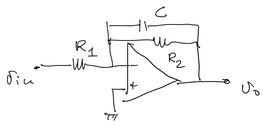
15-4-2021 El. II

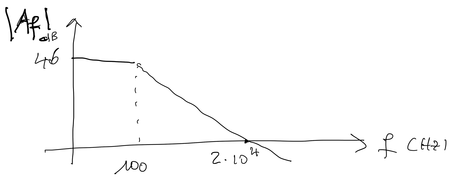
ES. 1

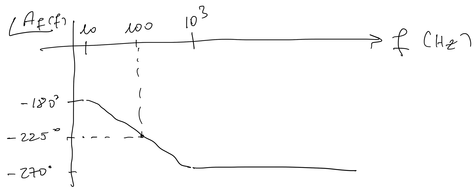
(a)

Come abbiamo visto a lezione, la funzione in questione si può realizzare con un AO in configurazione invertente:



$$A_f(f) = \frac{A_0}{1+jf/f_H} = -\frac{2\cdot 10^2}{1+jf/100}$$

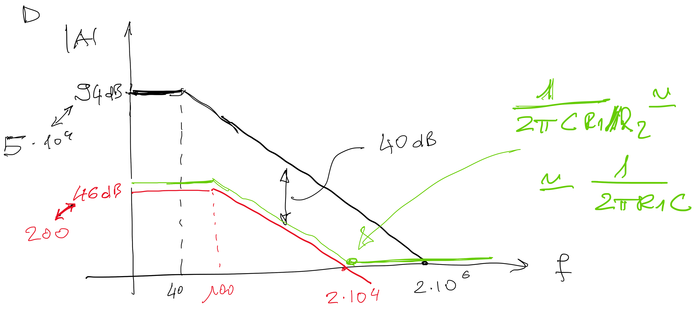




(b)

$$\beta = \frac{R_1}{R_1 + \frac{R_2}{1+j\omega C R_2}} = \frac{R_1(1+j\omega C R_2)}{(R_1+R_2)(1+j\omega C R_1 // R_2)}$$

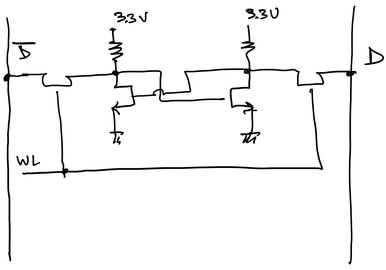
$$\boxed{1/\beta = \left(1+\frac{R_2}{R_1}\right)\frac{1+j\omega C R_1 // R_2}{1+j\omega C R_2}}$$



fino a $f \simeq \frac{1}{2\pi R_1 C} = 2\cdot 10^6\,Hz$ $|1/\beta|$ è praticamente coincidente con $|A_f|$, poi coincide con l'asse delle ascisse

ES. 2

RAM statica 256 Mb = 2^{28} bit



$$P_{d\,tot\,MAX} = 50\,mW \Rightarrow P_{cella\,MAX} = \frac{50\cdot 10^{-3}}{2^{28}}\,W = 186\,pW$$

$$I_{TOT\,MAX} = \frac{50\cdot 10^{-3}}{3.3}\,A = 15.2\,mA$$

$$\boxed{I_{cella\,MAX} = \frac{15.2\cdot 10^{-3}}{2^{28}} = 56.4\,pA}$$

$$R_{MIN} \Rightarrow \frac{3.3-0.25}{R_{min}} = 56.4\,pA \Rightarrow \boxed{R_{MIN} = \frac{3.05}{56.4\cdot 10^{-12}} \simeq 54\,G\Omega}$$