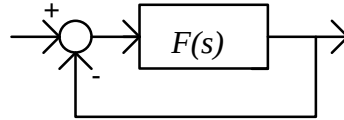


SISTEMA DEL SECONDO ORDINE

$$W(s) = \frac{1}{\frac{s^2}{w_n^2} + \frac{2x}{w_n}s + 1}$$

corrispondente alla funzione a ciclo aperto :

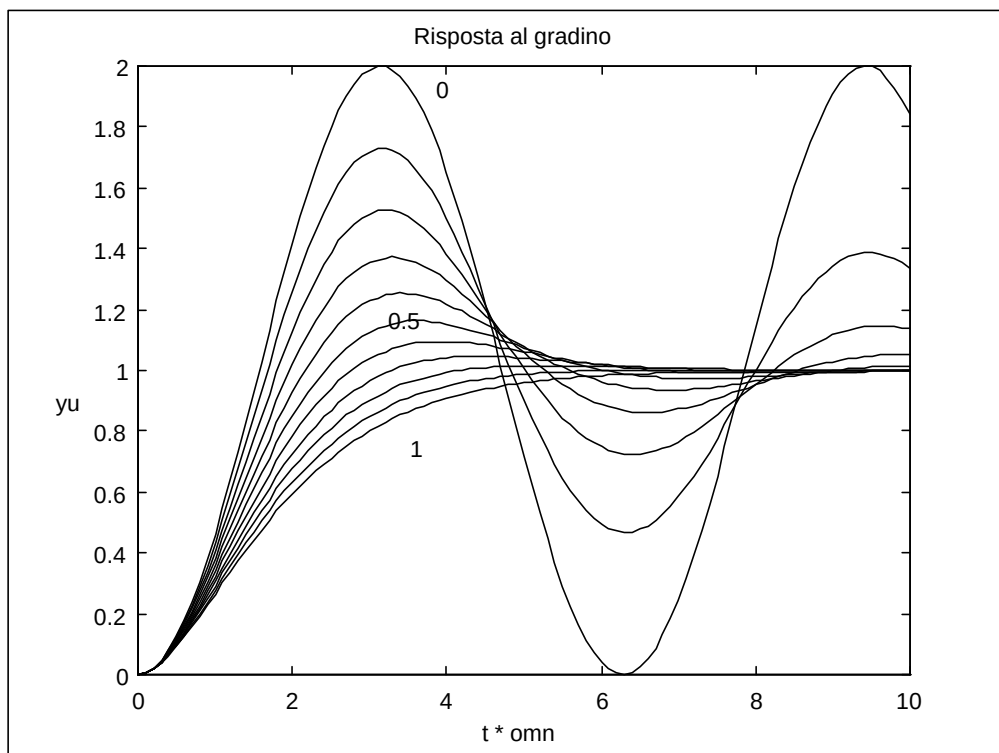
$$F(s) = \frac{\frac{w_n}{2x}}{s \left(\frac{s}{2xw_n} + 1 \right)}$$



Per valori di $0 < x < 1$ si ha:

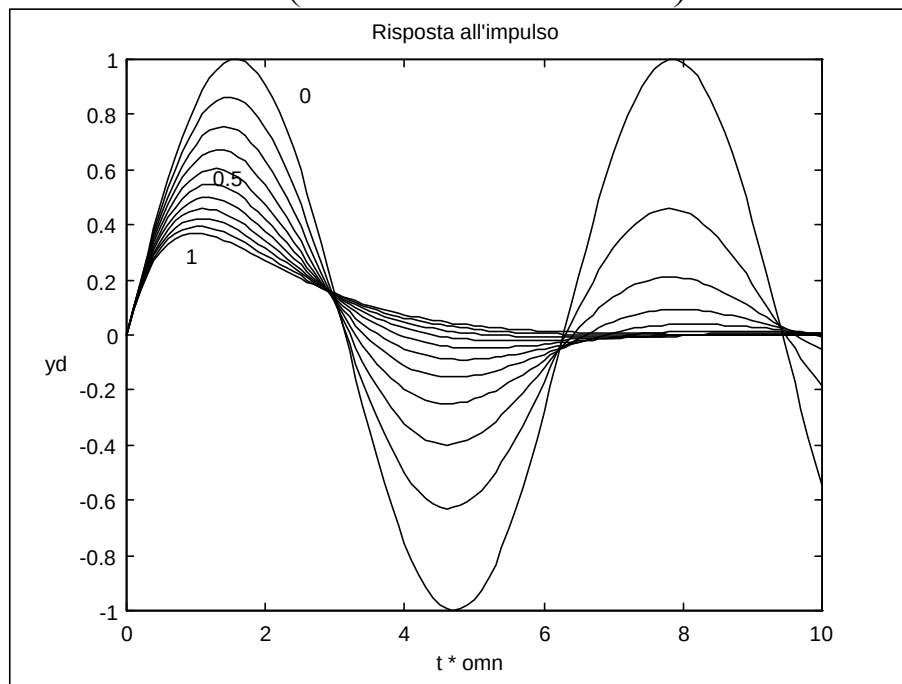
RISPOSTA AL GRADINO :

$$y_u(t) = \left(1 - \frac{1}{\sqrt{1-x^2}} e^{-xw_n t} \sin \left(\sqrt{1-x^2} w_n t + \arctan \left(\frac{\sqrt{1-x^2}}{x} \right) \right) \right) u(t)$$



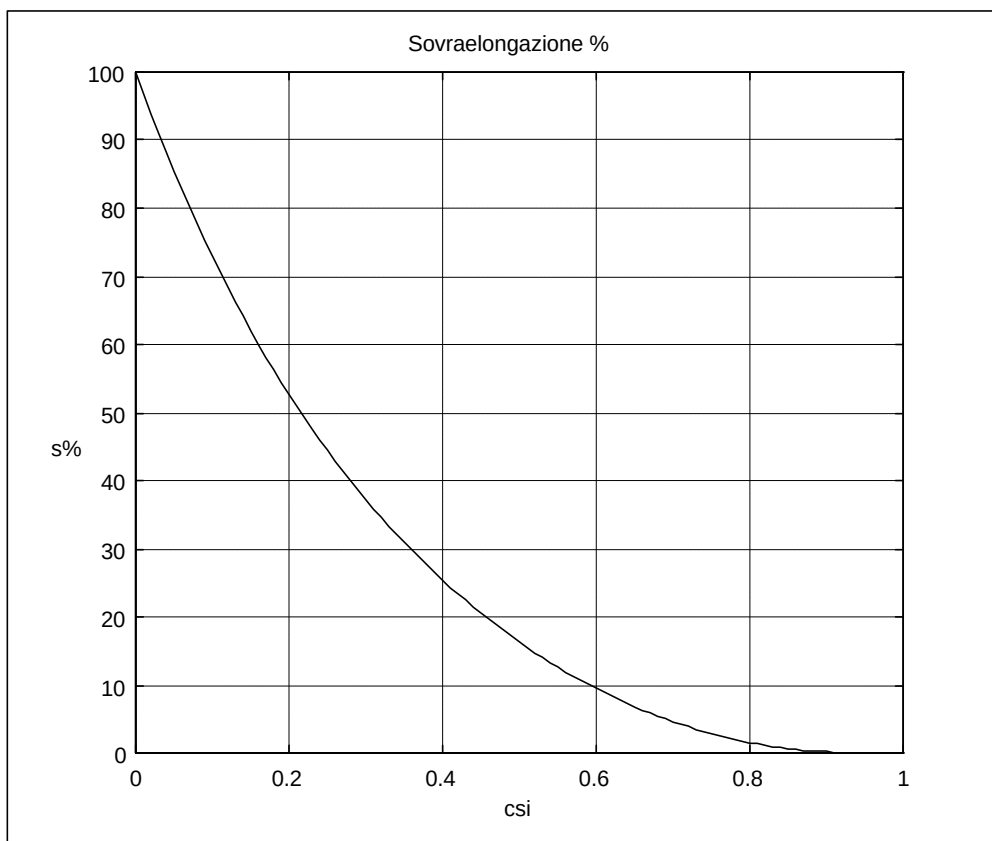
RISPOSTA ALL'IMPULSO :

$$y_d(t) = \left(\frac{w_n}{\sqrt{1-x^2}} e^{-xw_n t} \sin(\sqrt{1-x^2} w_n t) \right) u(t)$$



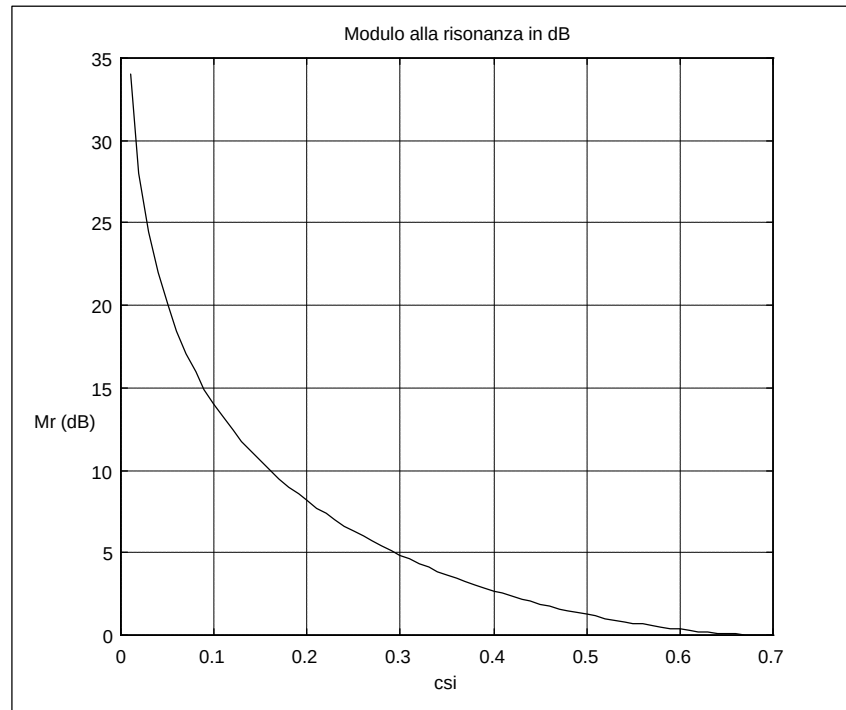
SOVRAELONGAZIONE

$$\hat{s}\% = 100 e^{-\frac{x p}{\sqrt{1-x^2}}}$$



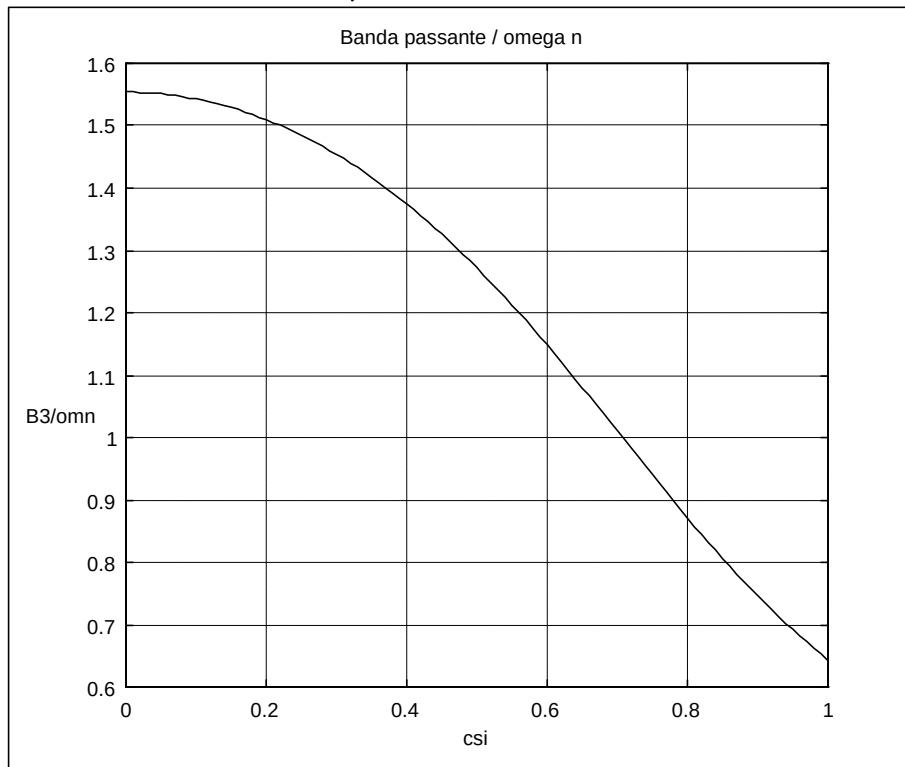
MODULO ALLA RISONANZA

$$Mr(dB) = 20 \log_{10} \left(\frac{1}{2x \sqrt{1-x^2}} \right) \quad \text{valida per} \quad 0 < x \leq \frac{\sqrt{2}}{2}$$



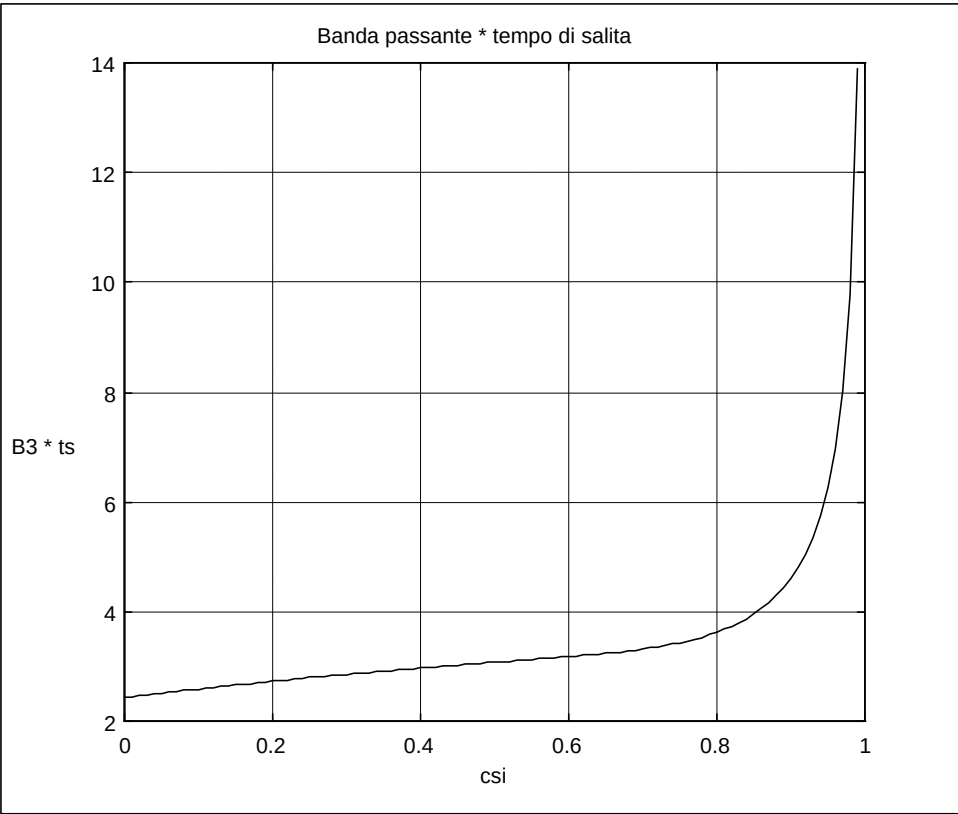
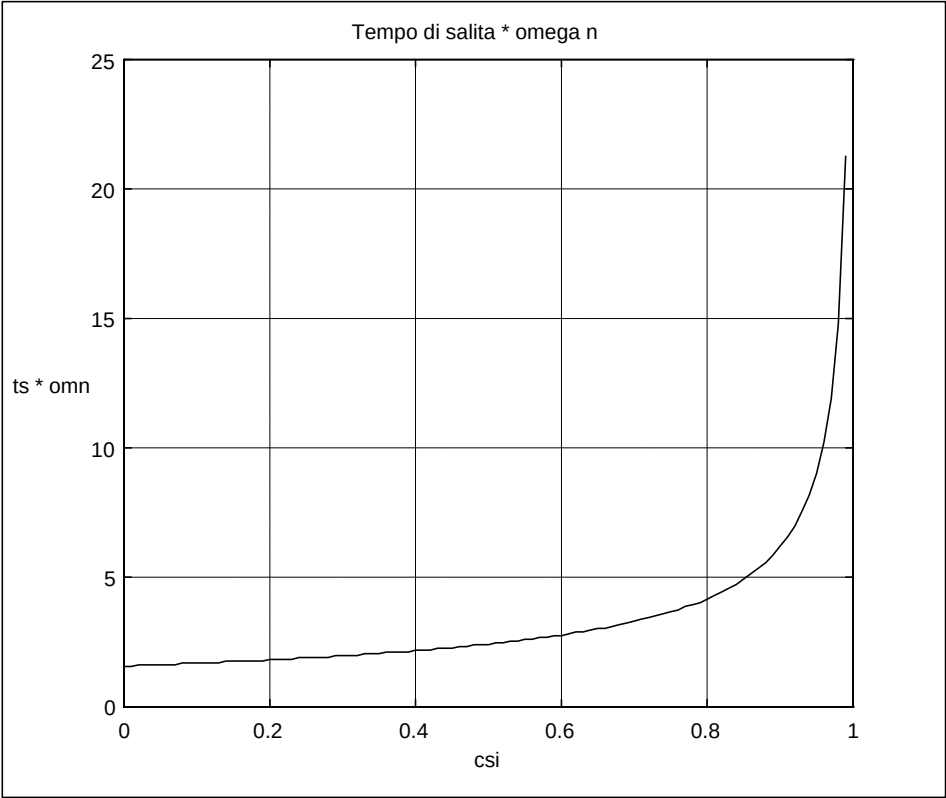
BANDA PASSANTE A 3 dB

$$B_3 = w_n \sqrt{1 - 2\zeta^2 + \sqrt{2 - 4\zeta^2 + 4\zeta^4}}$$



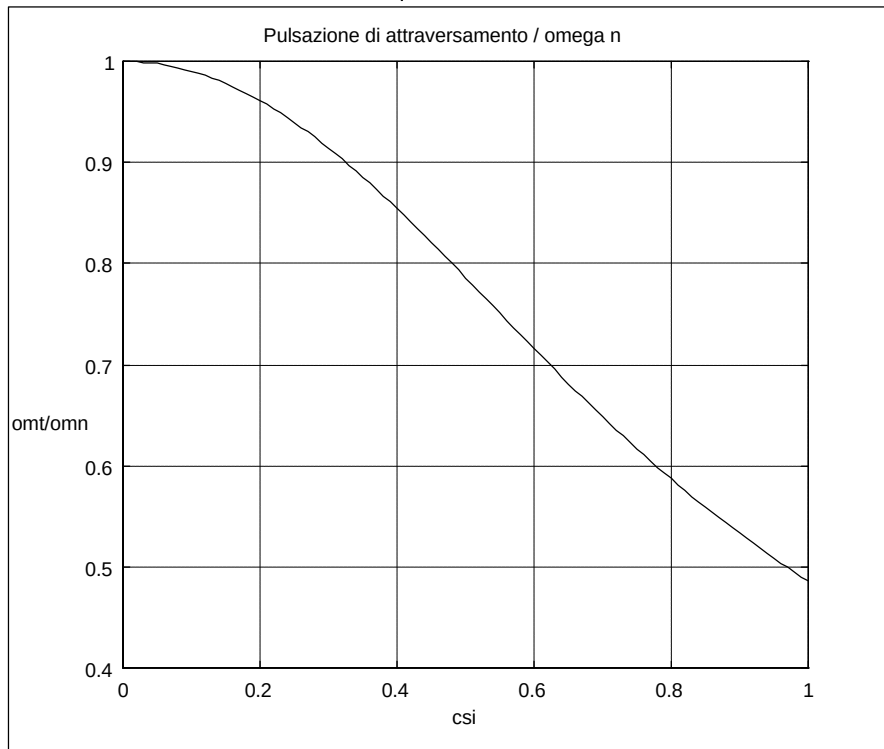
TEMPO DI SALITA

$$t_s = \frac{1}{w_n \sqrt{1-x^2}} \left(p - \arctan \left(\frac{\sqrt{1-x^2}}{x} \right) \right)$$



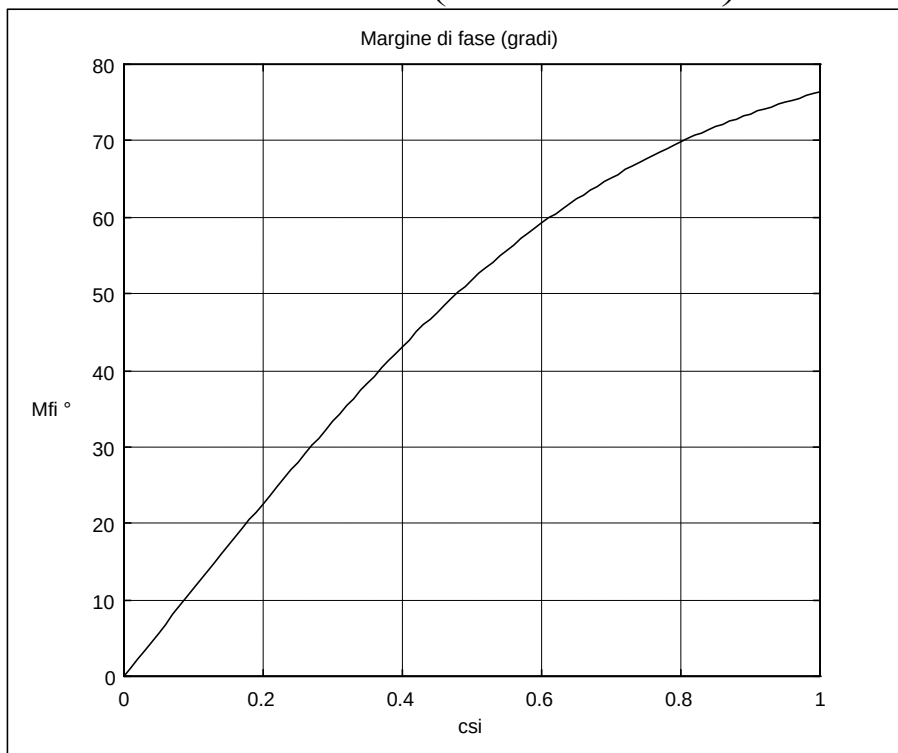
PULSAZIONE DI ATTRAVERSAMENTO

$$w_T = w_n \sqrt{-2x^2 + \sqrt{4x^4 + 1}}$$



MARGINE DI FASE

$$M_j = \frac{p}{2} - \arctan \left(\frac{\sqrt{-2x^2 + \sqrt{4x^4 + 1}}}{2x} \right)$$



ERRORE A REGIME PER INGRESSO A RAMPA

$$e_r(\infty) = \frac{1}{K_v} = \frac{2x}{w_n}$$

TEMPO DI PRIMO PICCO

$$t_P = \frac{p}{w_n \sqrt{1-x^2}}$$

TEMPO DI ASSESTAMENTO 2%

$$T_{a2\%} = \frac{4}{xw_n}$$