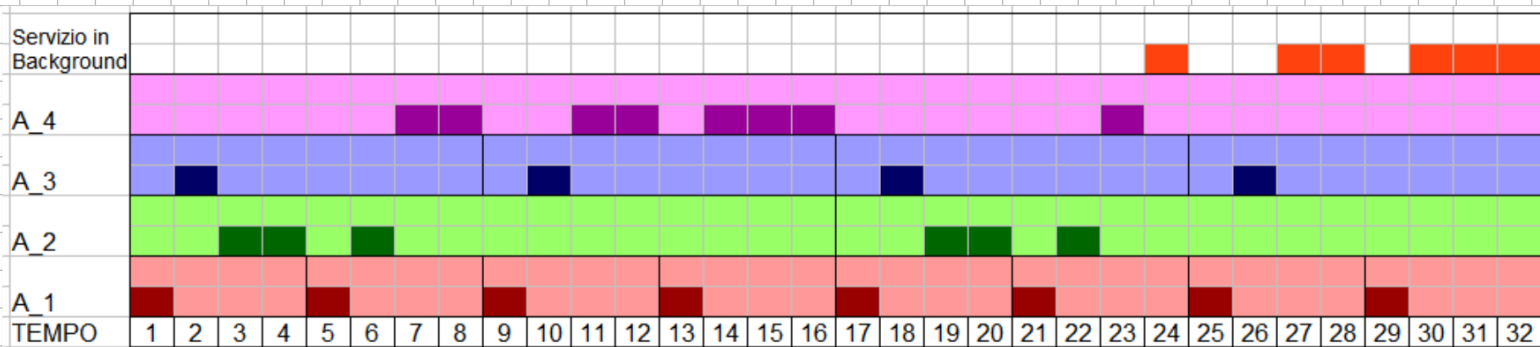


Es 1) L'insieme dei task gode di relazione armonica,

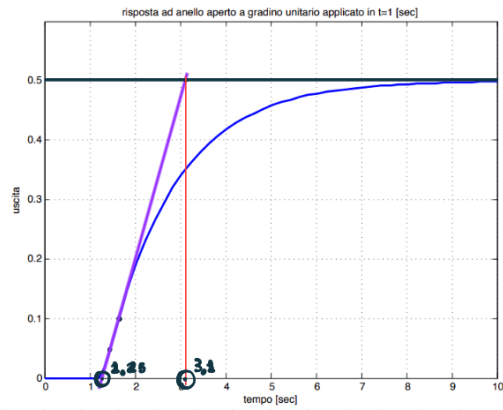
se $U \leq 1$, allora e' sicuramente schedulabile.

$$U = \frac{1}{4} + \frac{3}{16} + \frac{1}{8} + \frac{8}{32} = 0.8125, \text{ Esigo lo scheduling con RMPO:}$$



Il task aperiodico rispetta la deadline.

Es 2) Procedo a definire un modello del processo:



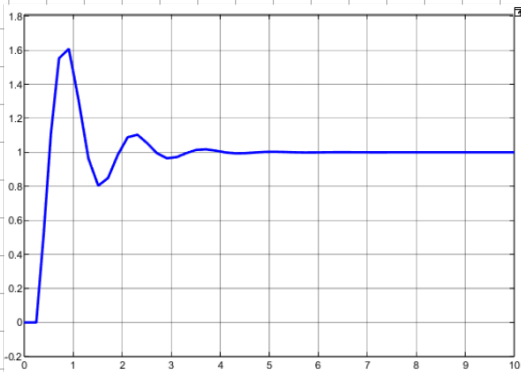
$$K = \frac{1}{2} \quad \theta = 0.25 \quad Z = 1.85 \quad P_m(s) = \frac{0.5 \cdot e^{-0.25s}}{1 + 1.85s}$$

$$\bullet \frac{1}{2} K_P = 0.5 \cdot \frac{1.85}{0.25} \Rightarrow K_P = 13.32$$

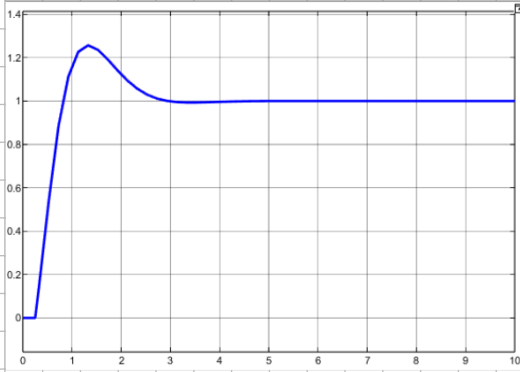
$$\bullet T_c = 3.33 \cdot 0.25 = 0.8325 \Rightarrow K_I = \frac{K_P}{T_c} = 16$$

L'azione integrale e' NECESSARIA per annullare l'errore a regime.

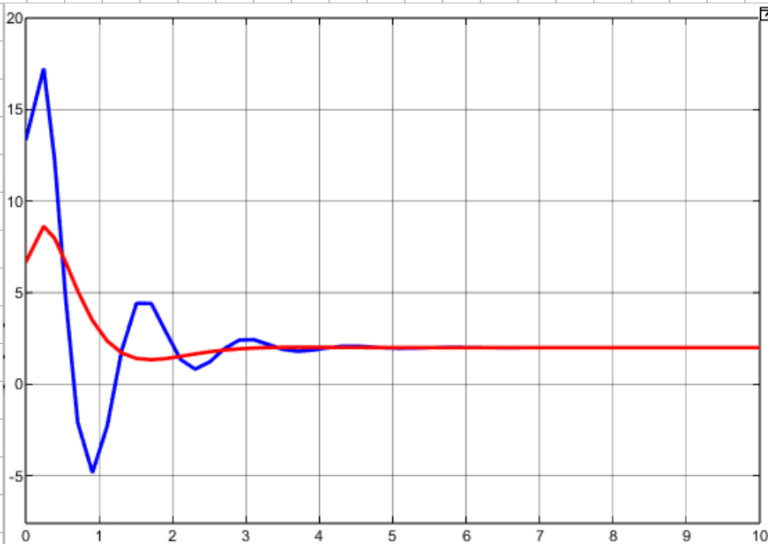
Risposta del modello controllato



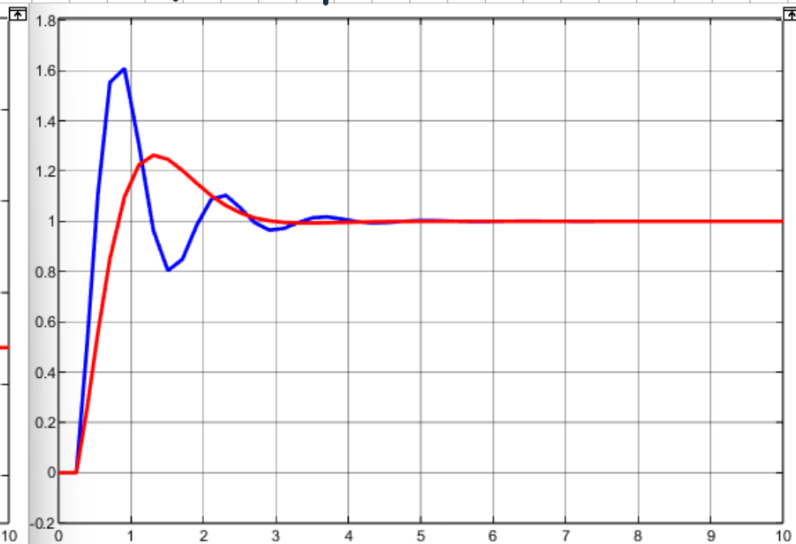
Risposta con guadagni dimezzati



sforzi di controllo



Risposte paragonate



Es 3) La matrice di incidenza e':

$$C = \begin{bmatrix} -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ -1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & -1 & 0 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 \\ -1 & -1 & 1 & & & & & & & & & & \\ & & -1 & 1 & & & & & & & 1 & & \\ & & & & -1 & 1 & & & & & & -1 & 1 \\ & 1 & & & & -1 & & & & & & & \\ & & & & & & -1 & 1 & & & & & \\ & & & & & & & & -1 & 1 & 1 & & \\ & & & & & & & & & & -1 & & \\ & & & & & & & & & & & & -1 \end{bmatrix}$$

$$\Rightarrow \begin{matrix} -5 \\ 5 \\ 10 \end{matrix}$$

$$\text{Ker}(C^T) = \left\{ \begin{bmatrix} a \\ b \\ a+b \\ a \cdot b \\ b \\ c \\ F \\ d+c \\ c \\ d \\ e \\ c+e-F \\ d \cdot F \end{bmatrix} \right\} \quad \left. \begin{matrix} a, b, c, d, e, f \\ \in \mathbb{R} \end{matrix} \right\}$$

I P-invarianti sono:

$$\begin{aligned} & (1011000000000)^T \\ & (0111000000000)^T \\ & (0000010100010)^T \\ & (0000000101001)^T \\ & (0000011211000)^T \end{aligned}$$