

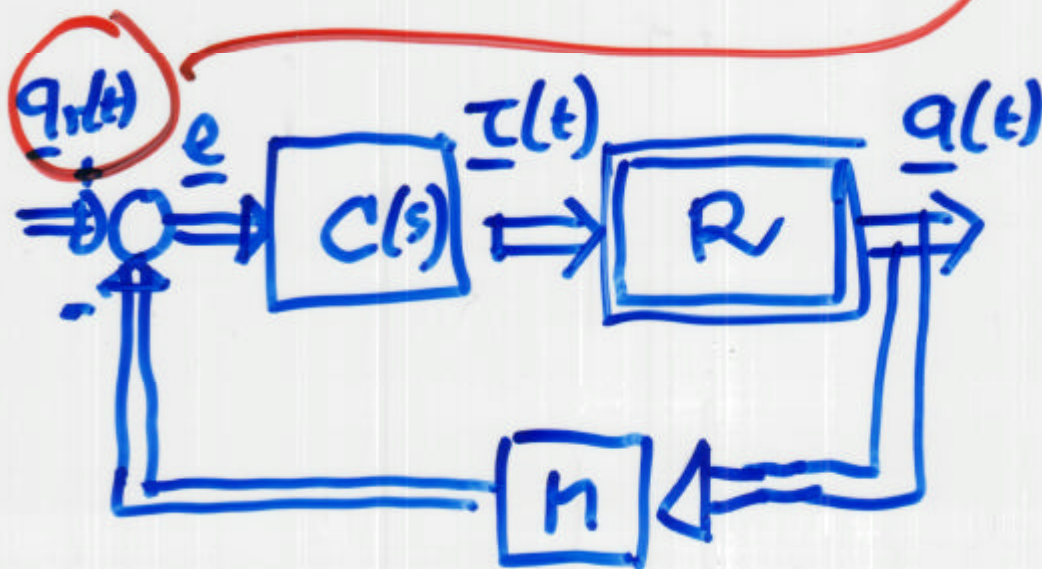
GRUPPI DI 6-7 STUDENTI

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LUN	1030	1230	} NON FUORI TORINO
LUN	1230	1430	
MAR	1430	1630	
MER	1030	1230	
GIO	1030	1230	

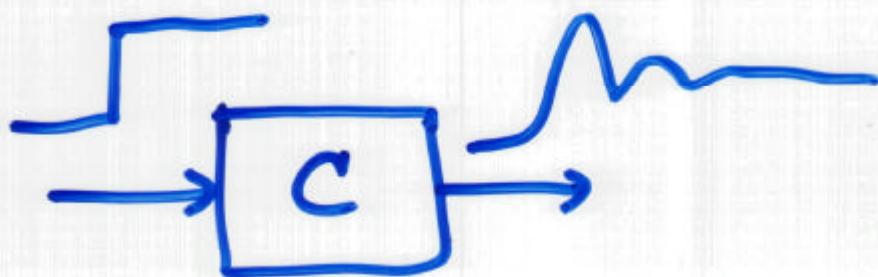
PIANIFICAZIONE DEL RIFERIMENTO
o
GENERAZIONE

ROBOT INDUSTRIALE

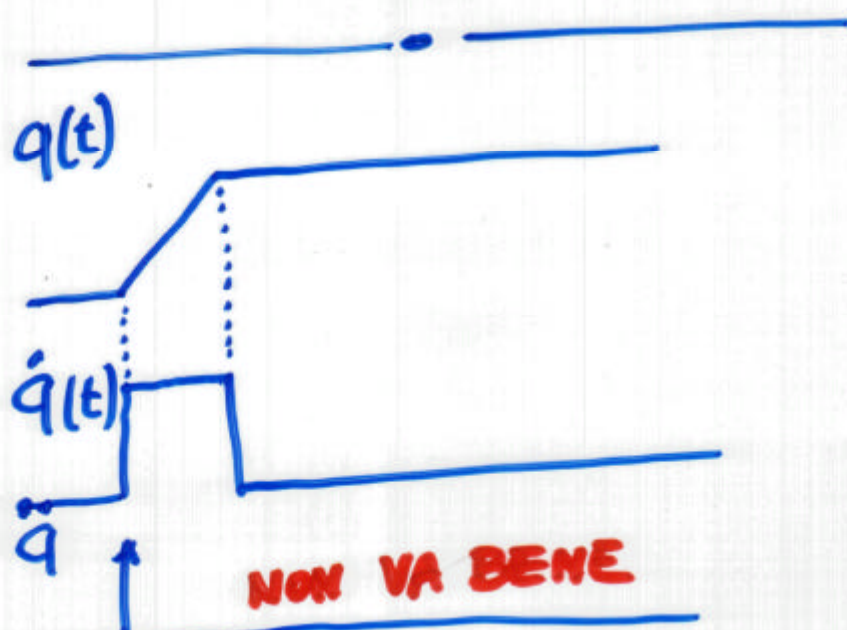
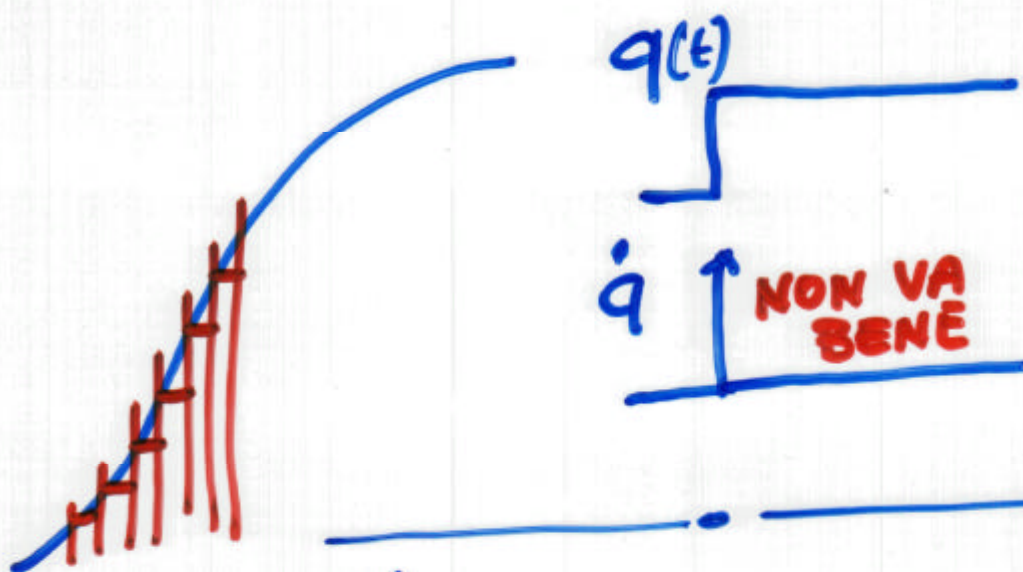
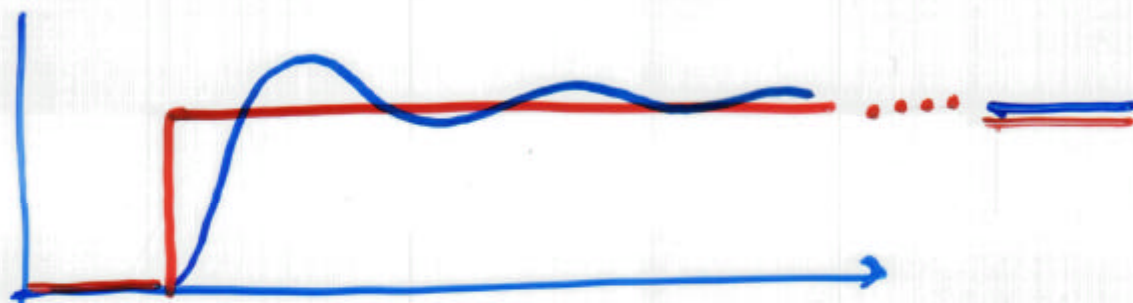


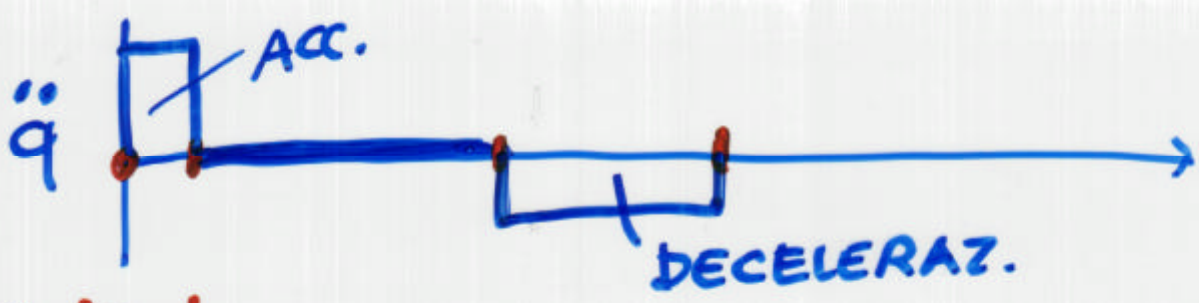
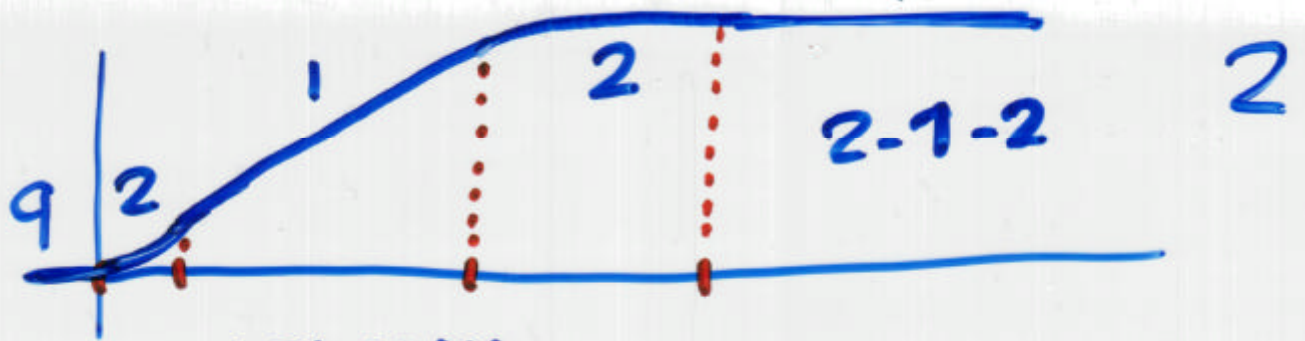
$$\underline{\tau}(s) = \underline{C}(s) \underline{e}(s)$$

PROGETTO



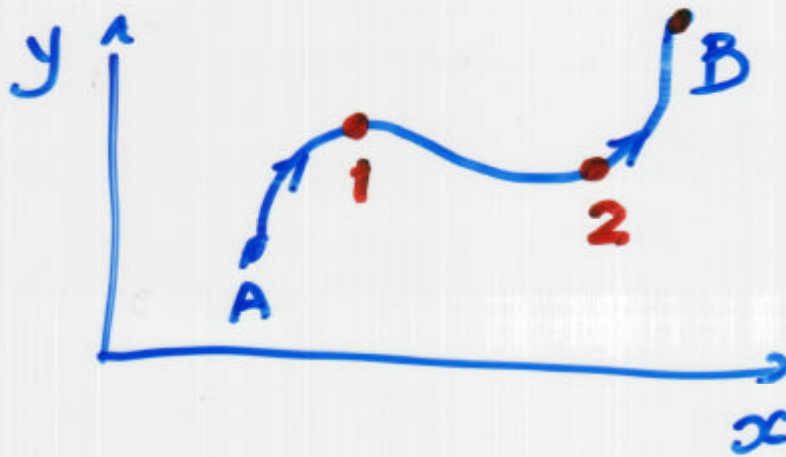
1.B





$\ddot{q}$ jerk

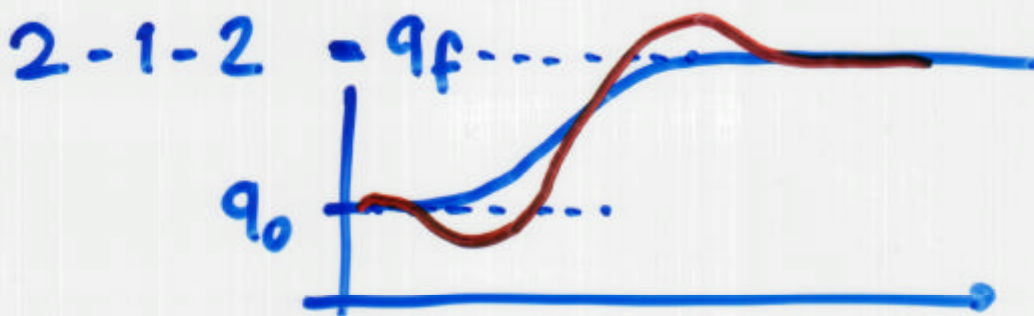




MOTO COORDINATO

TUTTE LE STORIE TEMPORALI $q_i(t)$
iniziano in $t=t_0$ e terminano
tutte in $t=t_f$

_____ 0 _____



1) PIANIFICAZIONE / RIFERIMENTO NEL (TEMPO) CONTINUO

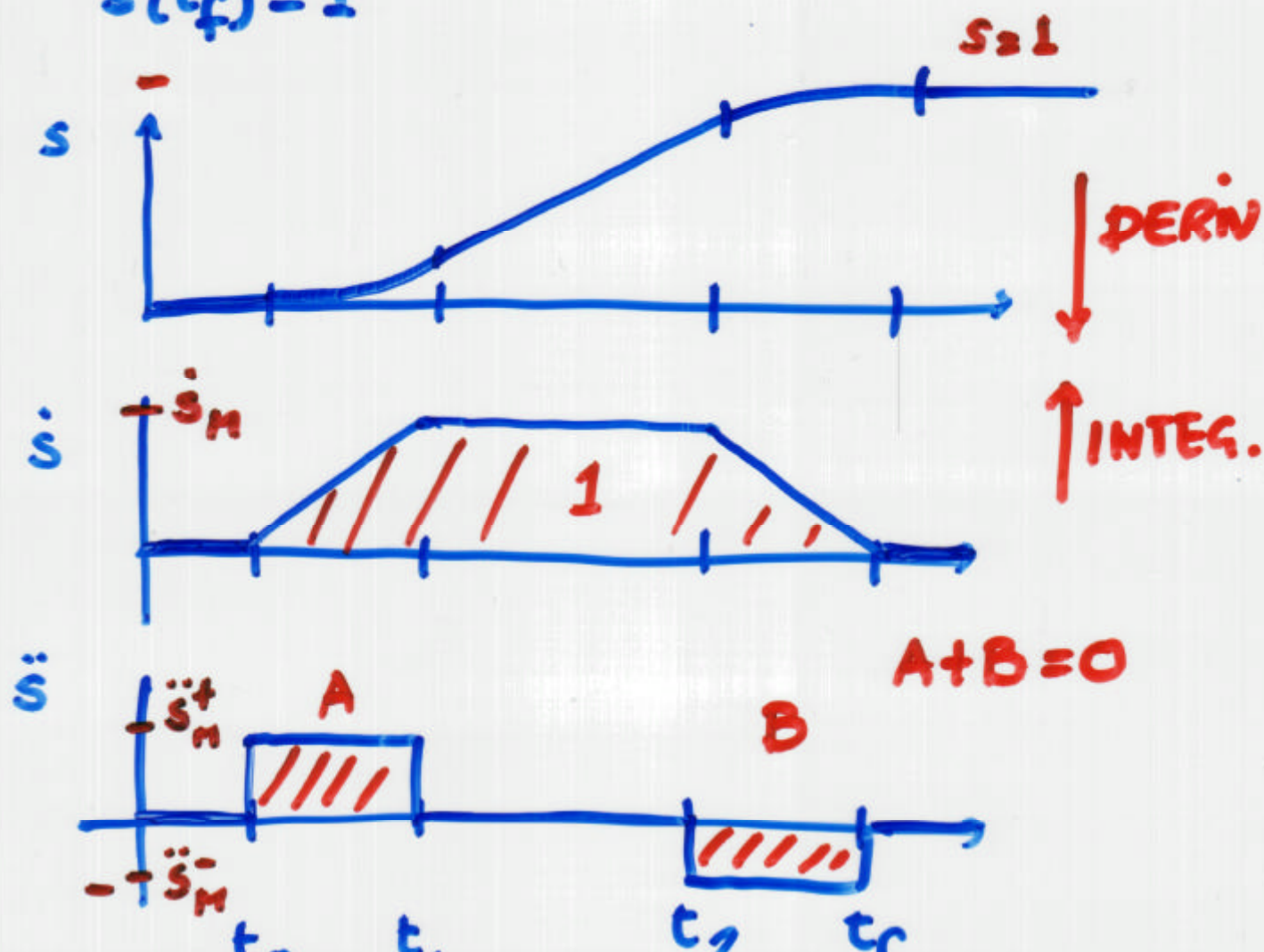
2) PIANIFICAZIONE DI UNA VARIABILE $s(t)$

$$0 \leq s(t) \leq 1$$

% del cammino percorso

$$s(t_0) = 0$$

$$s(t_f) = 1$$



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$$I_1 = \{t: t_0 \leq t < t_1\}$$

$$I_2 = \{t: t_1 \leq t < t_2\}$$

$$I_3 = \{t: t_2 \leq t \leq t_f\}$$

$$\ddot{s}(t) = \begin{cases} \ddot{s}_n^+ & t \in I_1 \\ 0 & t \in I_2 \\ -\ddot{s}_n^- & t \in I_3 \end{cases}$$

$$\Downarrow$$

$$\dot{s}(t) = \begin{cases} \ddot{s}_n^+(t-t_0) + \cancel{\dot{s}_0}^{=0} & t \in I_1 \\ \dot{s}_n & t \in I_2 \\ \dot{s}_n - \ddot{s}_n^-(t-t_2) & \end{cases}$$

$$\Downarrow$$

$$s(t) = \begin{cases} \frac{1}{2} \ddot{s}_n^+(t-t_0)^2 + \cancel{\dot{s}_0}^{=0}(t-t_0) + \cancel{s_0}^{=0} \\ \dot{s}_n(t-t_1) + s_1 \\ -\frac{1}{2} \ddot{s}_n^-(t-t_2)^2 + \dot{s}_n(t-t_2) + s_2 \end{cases}$$

$$s_1 = \dots$$

$$s_2 = \dots$$

$$s_1 = \dots$$

$$s_2 = \dots$$

$$s_f = 1$$

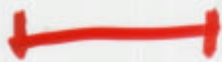
$$\dot{s}_1 = \dot{s}_2 = \dot{s}_n = \ddot{s}_n^+(t_1 - t_0)$$

$$\vdots$$

$$t_1 - t_0 = \frac{\dot{s}_n}{\ddot{s}_n^+}$$

$$t_f - t_2 = \frac{\dot{s}_n}{\ddot{s}_n^-}$$

$$t_2 - t_1 = \frac{1}{\dot{s}_n} - \frac{1}{2} \left(\frac{\dot{s}_n}{\ddot{s}_n^+} + \frac{\dot{s}_n}{\ddot{s}_n^-} \right)$$

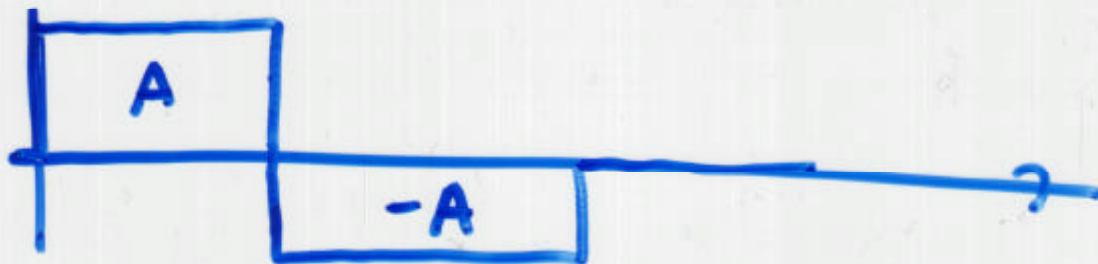
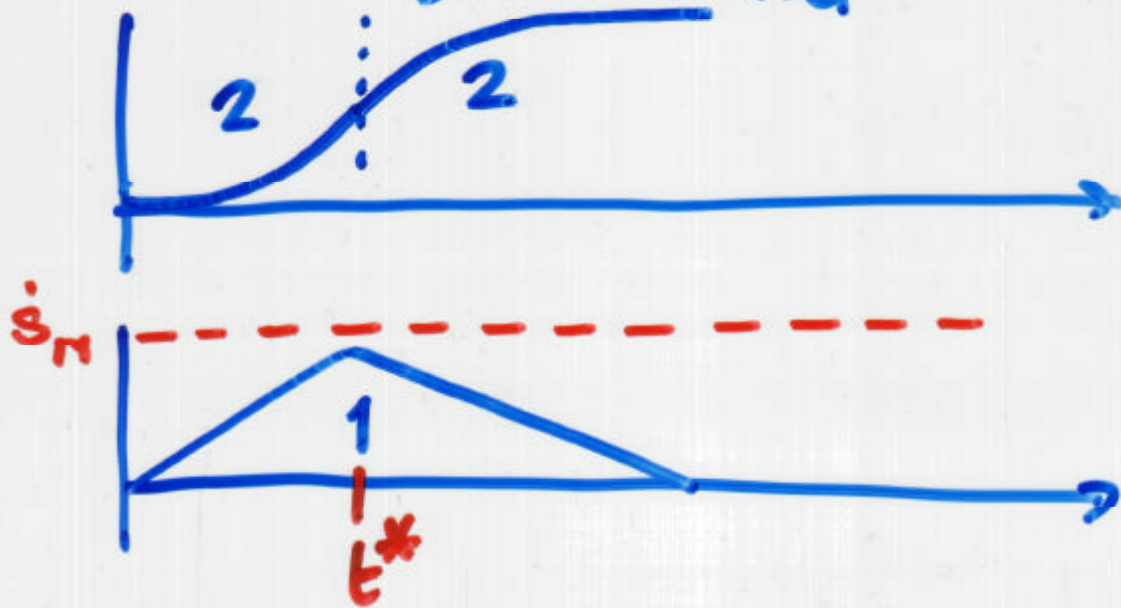


INTERVALLO A VEL. COSTANTE

$$\frac{1}{2} \left(\frac{\dot{s}_n}{\ddot{s}_n^+} + \frac{\dot{s}_n}{\ddot{s}_n^-} \right) \geq \frac{1}{\dot{s}_n} \quad ?!?$$

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BANG-BANG



$$I_1 \quad t: \quad t_0 \leq t < t^*$$

$$I_2 \quad t: \quad t^* \leq t \leq t_f$$