

Fondamenti di

Automatica

a. a. 2022/23

20/04/23

4 febbraio 2022

Nome e Cognome:

gruppo:

esercizio:

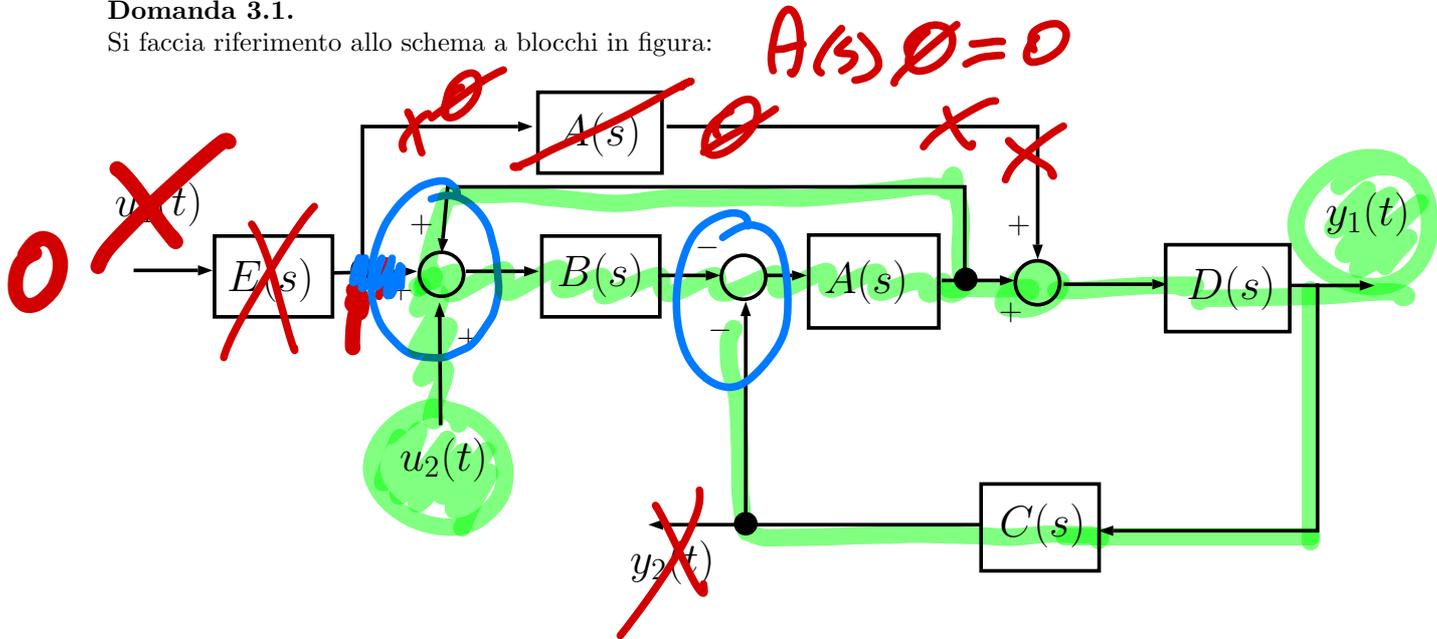
intervallo di tempo a disposizione: 60 minuti

Gruppo B

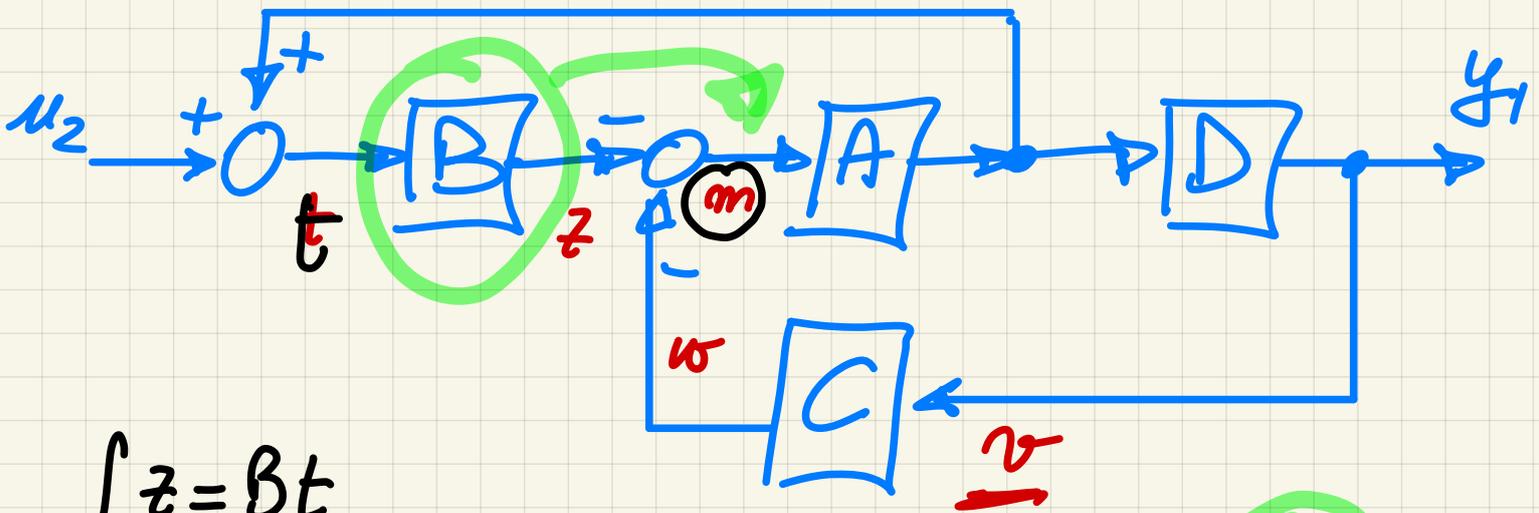
Esercizio 3 – 3 esercizi

Domanda 3.1.

Si faccia riferimento allo schema a blocchi in figura:



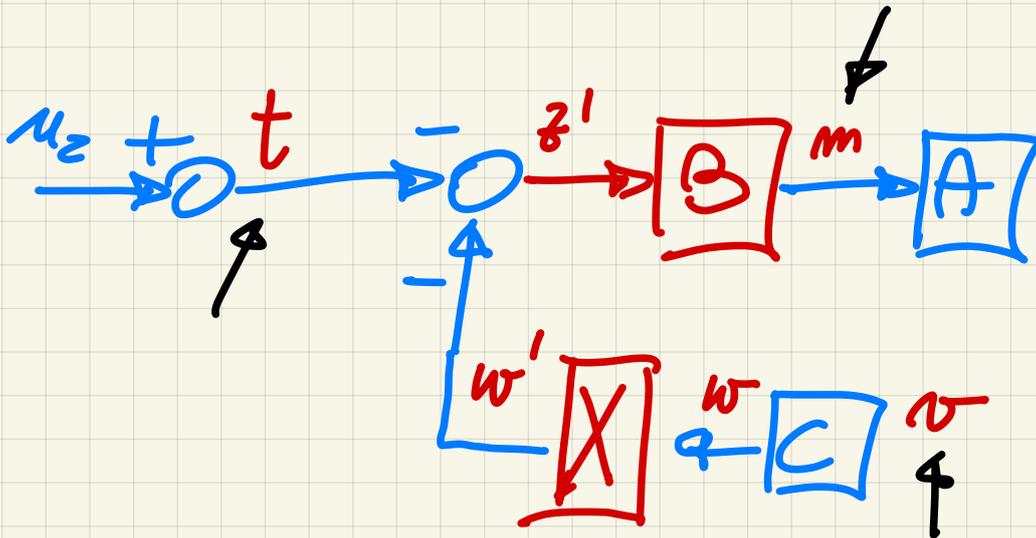
Determinare l'espressione della funzione di trasferimento dall'ingresso $u_2(t)$ all'uscita $y_1(t)$.



$$\begin{cases} \dot{z} = Bt \\ m = -z - w = -Bt - Cv \\ w = Cv \end{cases}$$

$$m = -Bt - Cv$$

Spjotta B



$$m = Bz'$$

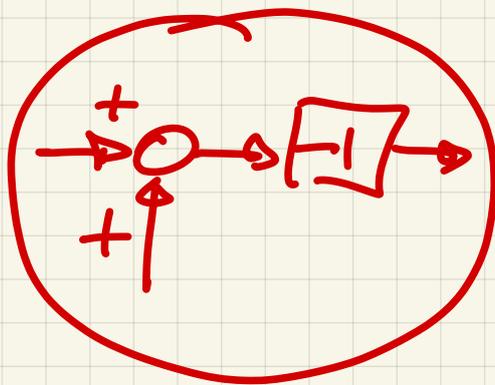
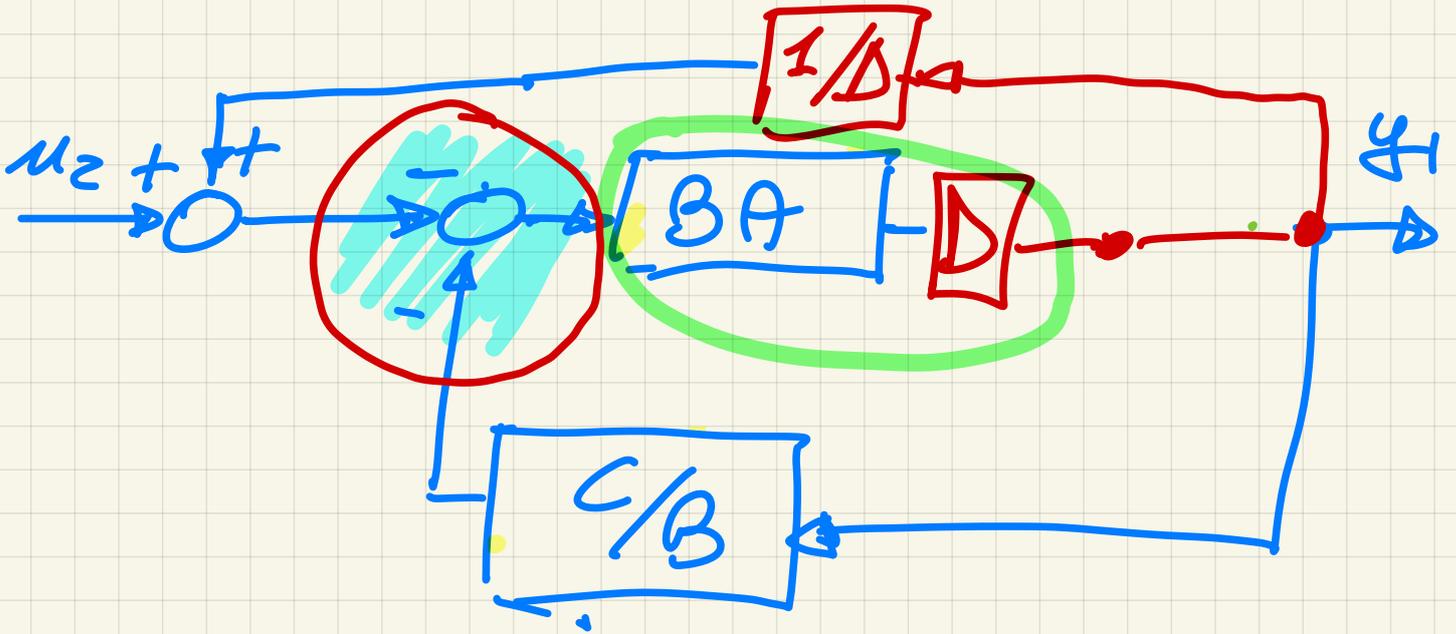
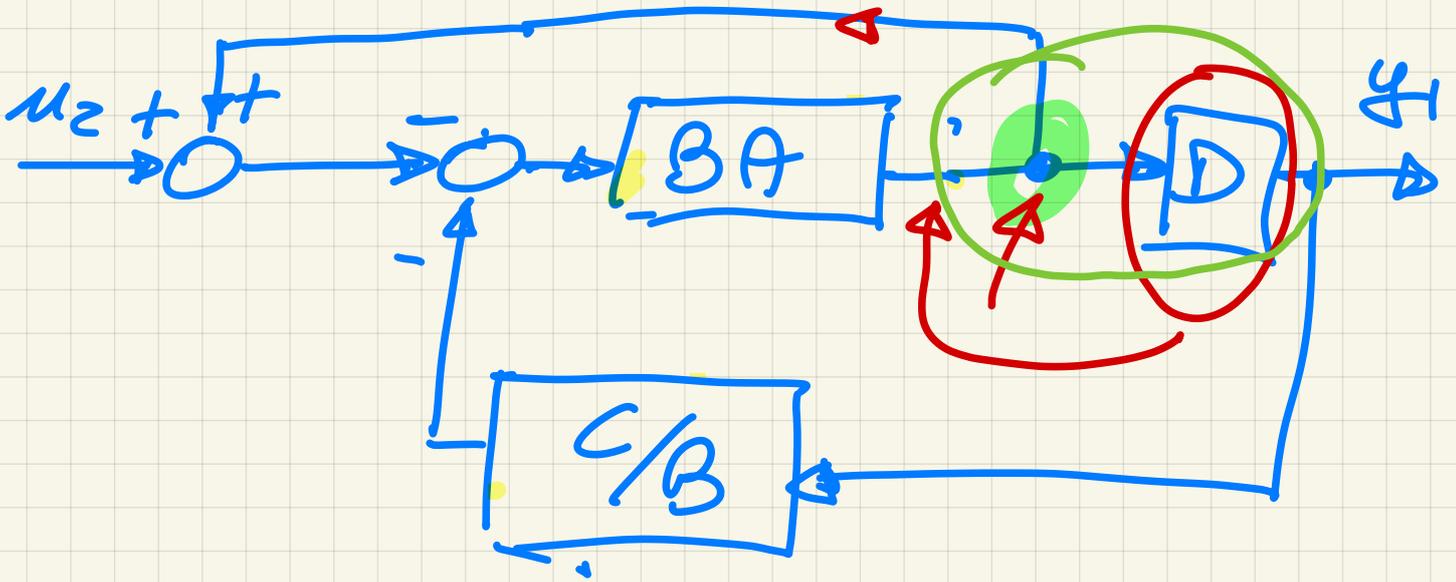
$$z' = -t - w'$$

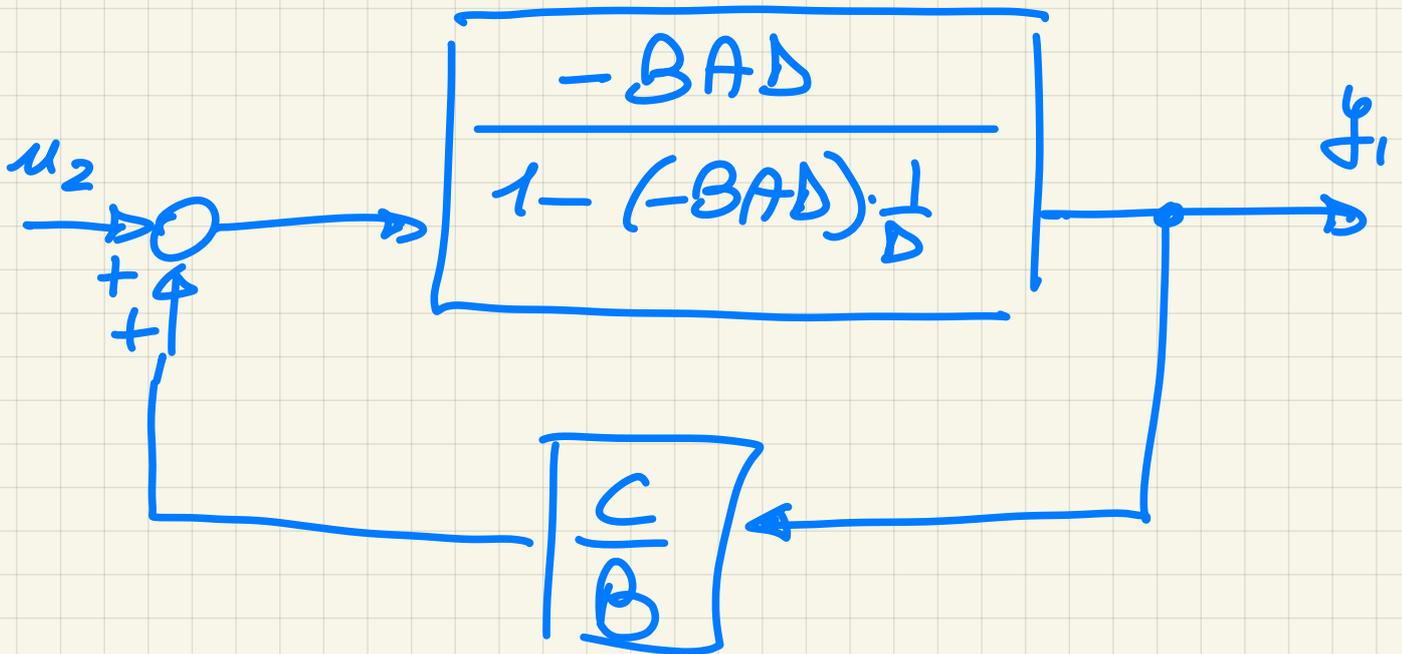
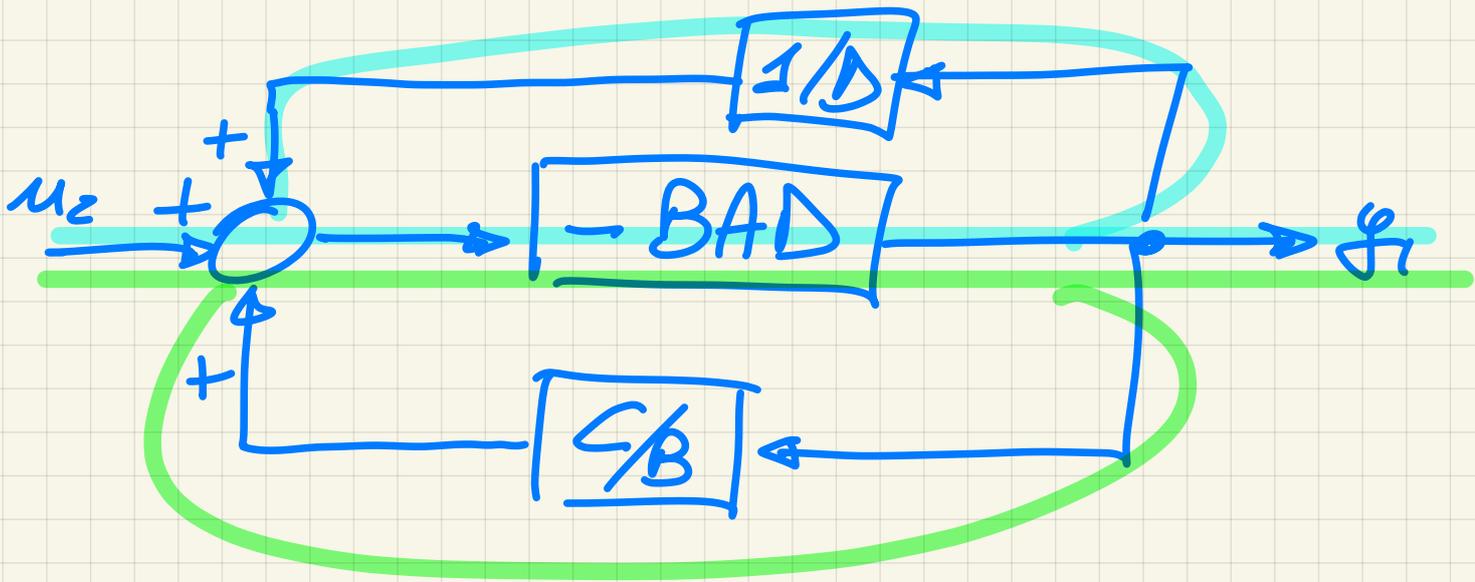
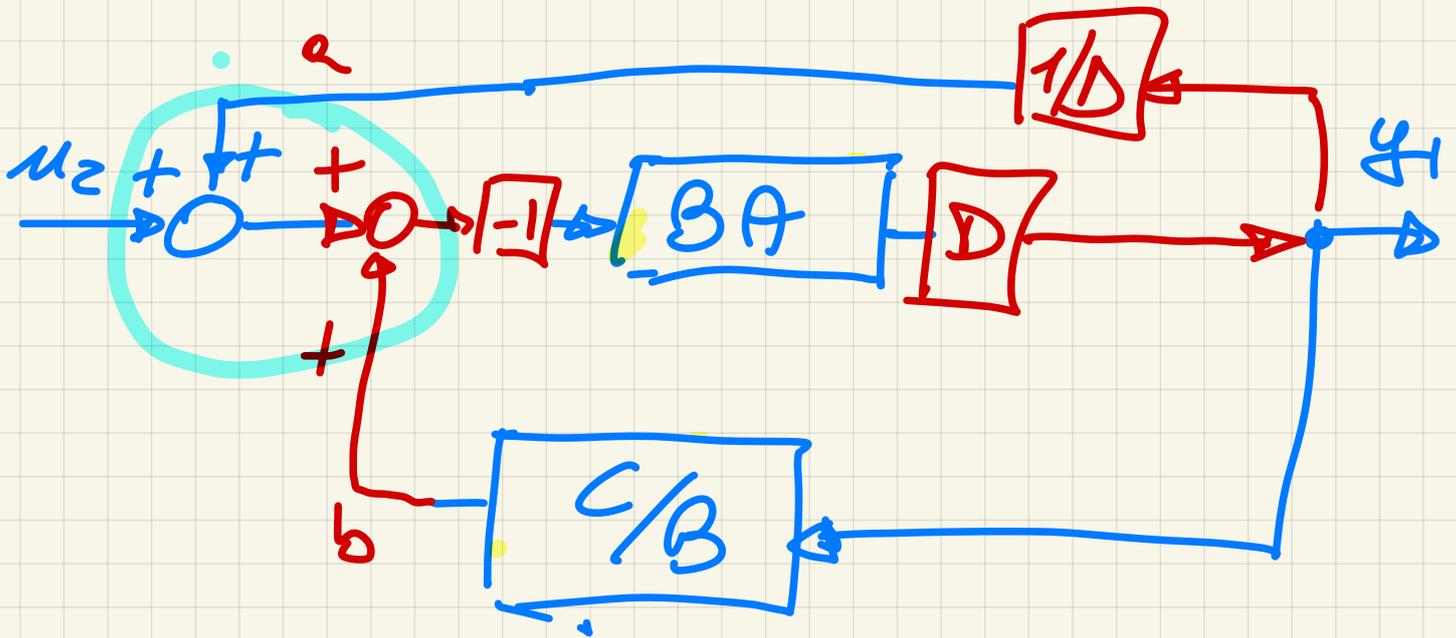
$$w' = Xw$$

$$w = Cv$$

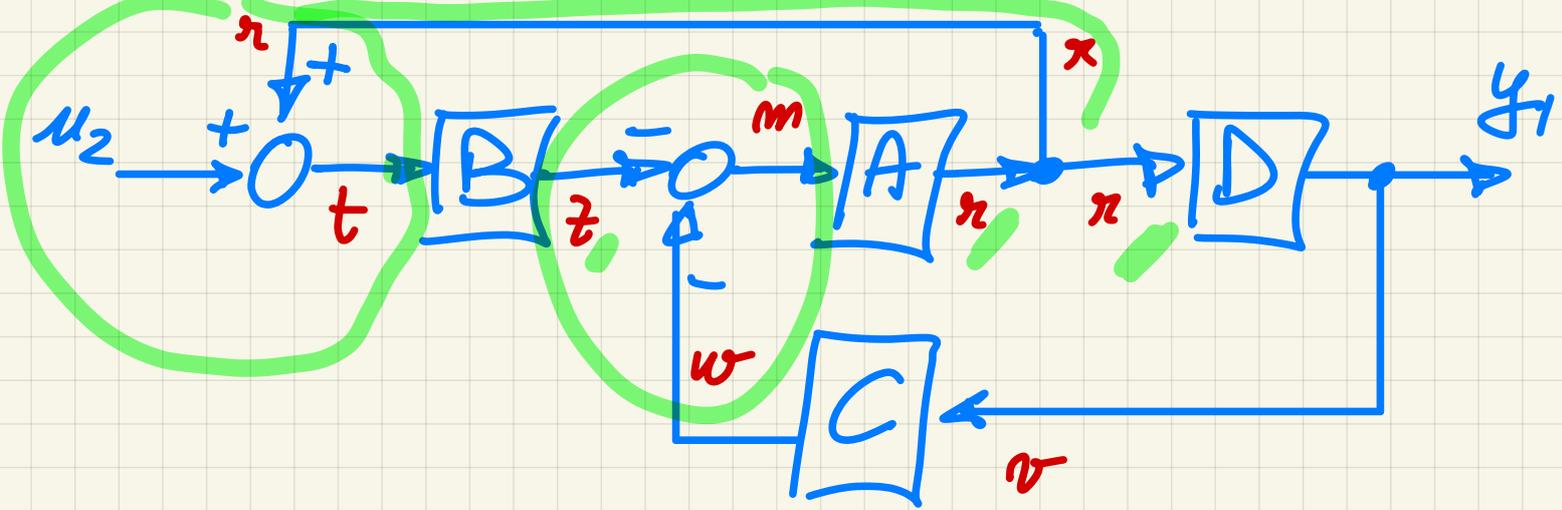
$$m = B[-t - Xw] = -Bt - \frac{BX}{A}Cv$$

$$= -Bt - Cv \quad X = \frac{1}{B}$$





$$T_{u_2}^{y_1} = \frac{-\frac{BAD}{1+BA}}{1 + \frac{CAD}{1+BA}}$$
$$= -\frac{BAD}{1+BA + CAD}$$



$$\begin{cases} u_2 + r = t \\ z = Bt \\ m = -z - v \\ v = Cv \\ r = Am \\ y_1 = Dr \\ v = y_1 \end{cases}$$

$$z = B(u_2 + Am) = Bu_2 + BA m$$

$$= Bu_2 + BA(-z - Cv) =$$

$$= Bu_2 - BA(z + Cy_1)$$

$$z = Bu_2 - BAz - BACy_1$$

$$(1 + BA)z = Bu_2 - BACy_1$$

$$z = \frac{B}{1+BA} u_2 - \frac{BAC}{1+BA} y_1$$

$$y_1 = DA m = -DA(z + v) =$$

$$= -DAz - DACy_1$$

$$(1+DAC)y_1 = -DAz$$

$$y_1 = -\frac{DA}{1+DAC} \left[\frac{B}{1+BA} u_2 - \frac{BAC}{1+BA} y_1 \right]$$

$$y_1 = -\frac{DAB}{(1+DAC)(1+BA)} u_2 + \frac{DA}{1+DAC} \cdot \frac{BAC}{1+BA} y_1$$

$$\left[1 - \frac{DBAC}{(1+DAC)(1+BA)} \right] y_1 = -\frac{DAB}{(1+DAC)(1+BA)} u_2$$

$$y_1 = -\frac{DAB}{\cancel{(1+DAC)(1+BA)}} \cdot \frac{\cancel{(1+DAC)(1+BA)}}{1+BA+DAC+DA^2BC-DAC} \cdot u_2$$

$$y_1 = -\frac{DAB}{1+BA+DAC} u_2$$

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Gruppo B

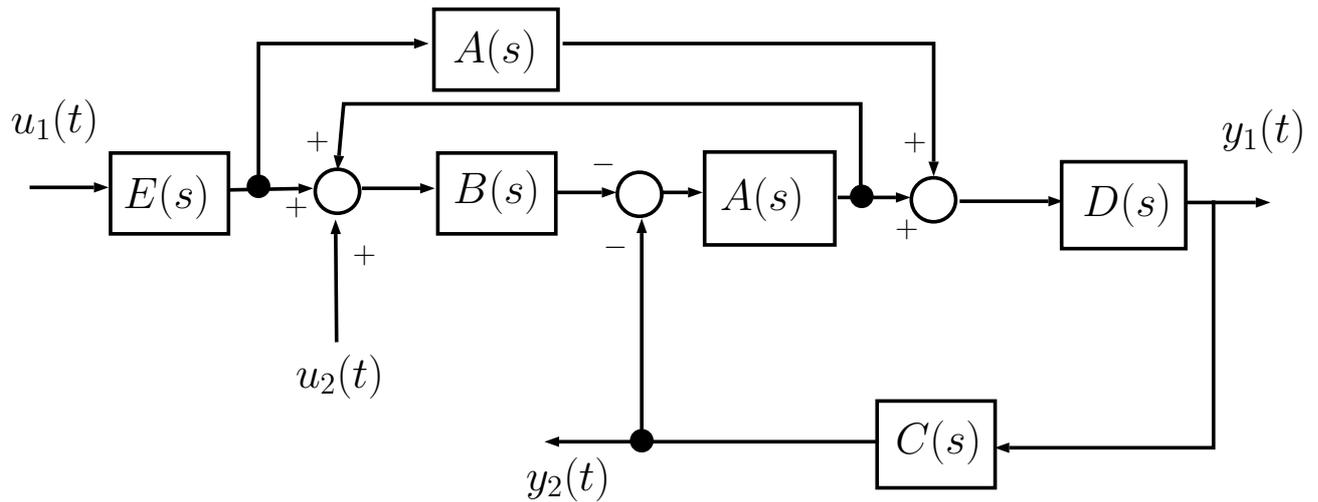
esercizio:

Esercizio 3 – 3 esercizi

intervallo di tempo a disposizione: 60 minuti

Domanda 3.1.

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