Mechanical System Diagram in LaTeX Tikz

CBCO

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Given the mechanical system free body diagrams as shown in Figure 1, (a) Draw the free body diagram and write the equation for Figure 1 (a) and (b) Draw the free body diagram and write the equation for Figure 1 (b)

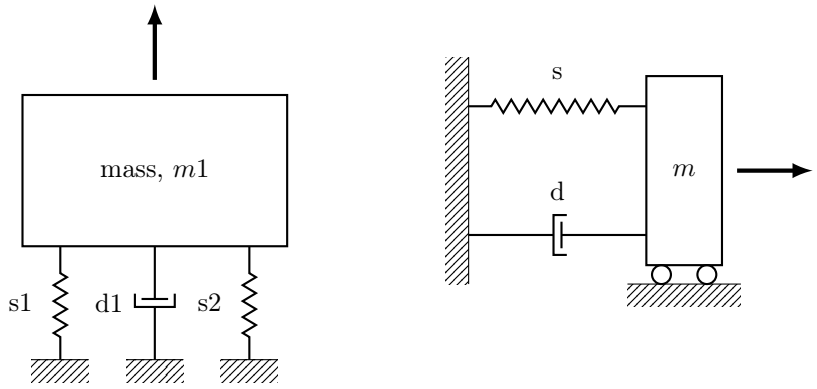

Figure 1: Mechanical System Diagram

The mechanical system in Figure 1 (a) is converted into free body diagram as shown in Figure 2.

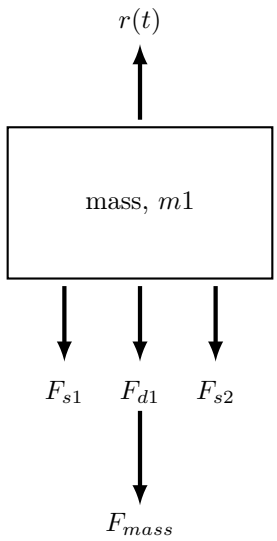

Figure 2: Mechanical System Free Body Diagram of Figure 1 (a)

Out of the free diagram in Figure 2, the system equation is generated as follows.

(1) $$F_{d1} + F_{mass} + F_{s1} + F_{s2} = r(t)$$

where

(2) $$F_{mass} = m_1 \frac{d^2}{dt^2} y(t)$$

(3) $$F_{s1} = K_1 y(t)$$

(4) $$F_{s2} = K_2 y(t)$$

(5) $$F_{d1} = b_1 \frac{d}{dt} y(t)$$

Substituting (2), (3), (4), and (5),

(6) $$K_1 y(t) + K_2 y(t) + b_1 \frac{d}{dt} y(t) + m_1 \frac{d^2}{dt^2} y(t) = r(t)$$

The equation (6) could be arranged for control system block diagram.

$$-b_1 \frac{d}{dt} y(t) - (K_1 + K_2)\, y(t) + r(t) = m_1 \frac{d^2}{dt^2} y(t) \tag{7}$$

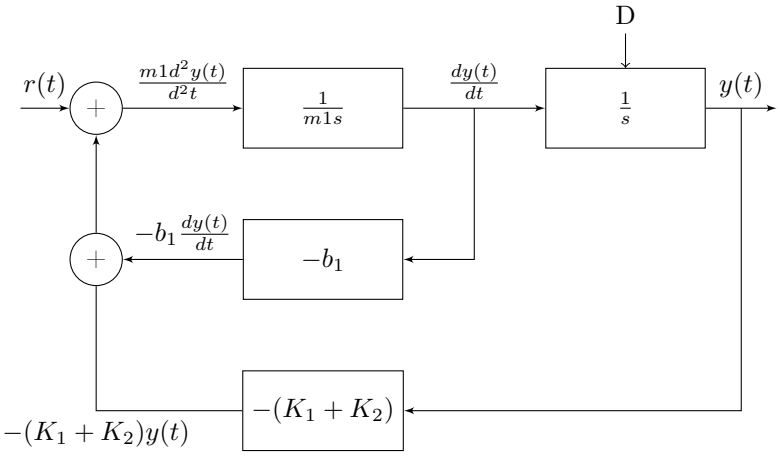

Figure 3: Control System Block Diagram

Exercise

Use latex for all your drawing. See latex codes above for your referenc.

1. Draw the free body diagram of mechanical system shown in Figure 1 (b).

2. From your free body diagram, derive the equation of the mechanical system.

3. Rearrange your equation for control system block diagram. Generate the control system block diagram.

References

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