Exercises 3: Block diagram and Laplace transform by using MATLAB
(FYSS 585)

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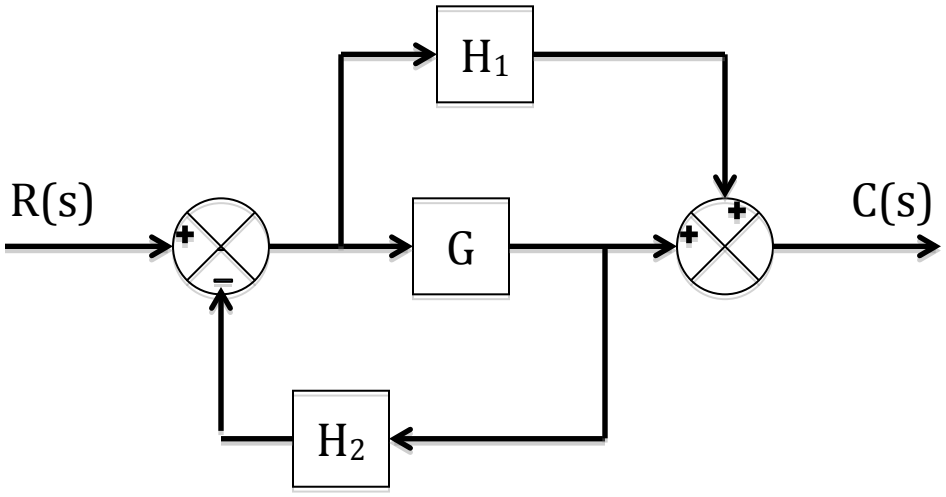
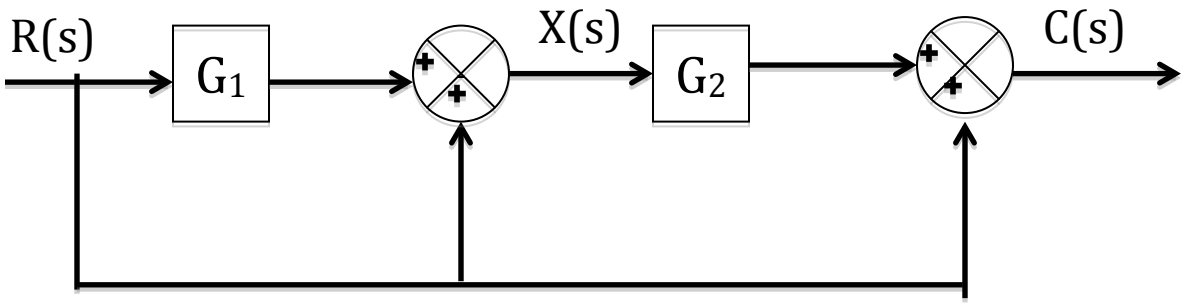
1. Simplify the block diagram shown in figure below.



2. Simplify the block diagram shown in figure below. Obtain the transfer function relating *C(s)* and *R(s)*



3. Calculate the Laplace *F(s)* transform of a function *f(t)* by using MATLAB

$$f(t) = -1.25 + 3.5te^{-2t} + 1.25e^{-2t}$$

Hint: To make the expression more readable one can use the commands, *simplify* and *pretty*.

4. Calculate the Inverse Laplace *F(s)* transform of a function *f(t)* by using MATLAB

4.1)

$$F(s) = \frac{(s-5)}{s(s+2)^2}$$

Compare the answer with a function *f(t)* in question 3.

4.2)

$$F(s) = \frac{10(s+2)}{s(s^2+4s+5)}$$

5. Calculate the Inverse Laplace *F(s)* transform of a function *f(t)* by using Partial-Fraction Expansion with MATLAB

5.1)

$$\frac{B(s)}{A(s)} = \frac{2s^3+5s^2+3s+6}{s^3+6s^2+11s+6}$$

5.2)

$$\frac{B(s)}{A(s)} = \frac{s^2+2s+3}{(s+1)^3}$$

Reference:

K. Ogata, *Modern Control Engineering*, Englewood Cliffs, N.J.: Prentice Hall, Inc., 1990.