Time and Frequency Domain Characteristics of Automatic Control Systems

Ex. 1.

For the system described by the equation (u – input, x – output)

$$4\frac{dx(t)}{dt} - 2u(t) = -x(t), \qquad x(0) = 0$$

determine and plot the step response

Ex. 2.

For the system described by the transfer function:

$$G(s) = \frac{2s}{4s+1}$$

determine and plot:

- impulse response
- amplitude-phase characteristic (Nyquist diagram).

Ex. 3.

For the system described by the transfer function:

$$G(s) = \frac{3}{s(2s+1)}$$

determine and plot the step, Nyquist, and Bode characteristics.

Ex. 4.

Plot the logarithmic characteristics (magnitude and phase) of the systems described by the following transfer functions (using the graphical method):

a) $G(s) = \frac{0.5}{5s^3 + 6s^2 + s}$ b) $G(s) = \frac{2}{250s^2 + 55s + 1}$

Ex. 5.

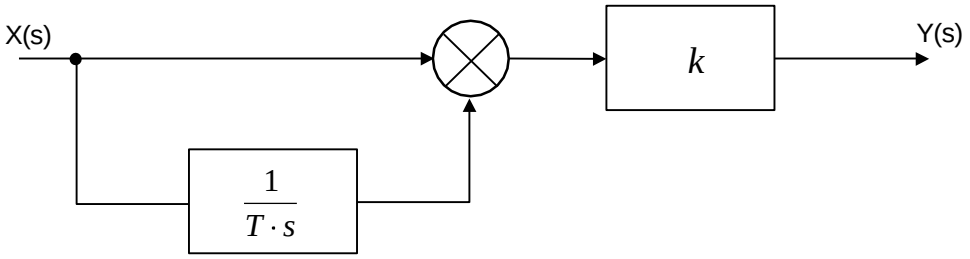
For the system described by the equation (u – input, y – output)

$$2\frac{dy(t)}{dt} - 2u(t) = -y(t)$$

determine and plot the amplitude-phase characteristic (Nyquist diagram).

Ex. 6.

Given is a system with the following structure:



Assuming that k = 5 and T = 5, determine and plot:

a) the step response of the system,
b) the amplitude-phase (Nyquist) characteristic of the system,
c) the magnitude and phase logarithmic characteristics of the system (Bode plots).