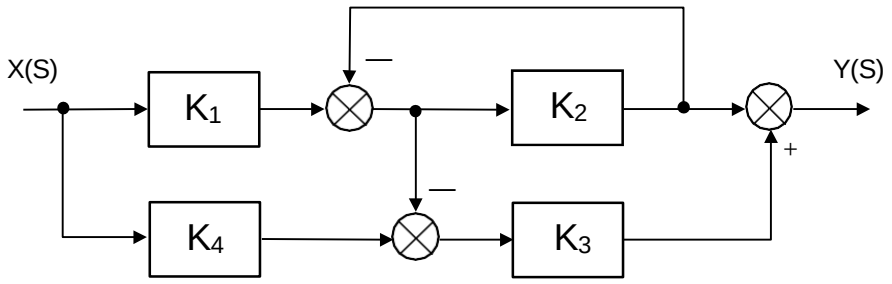
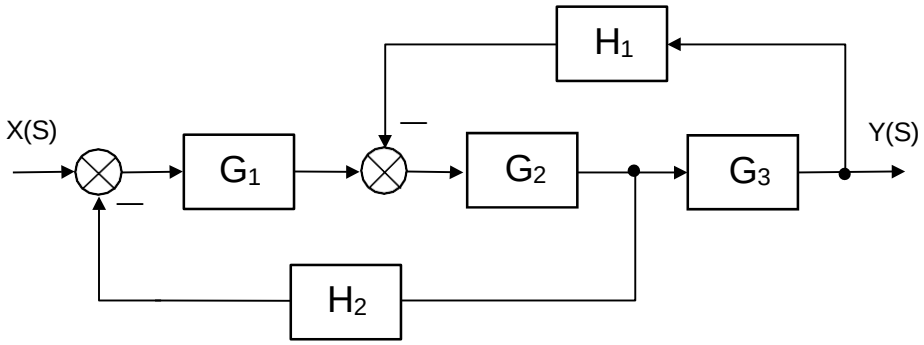
Block Diagram Reduction

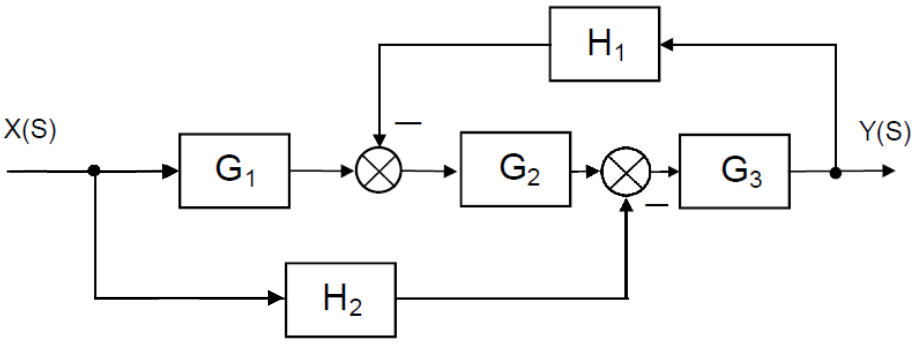
Ex. 1.
Determine the equivalent transfer function of the system.



Ex. 2.
Reduce the block diagram and determine the equivalent transfer function of the system.

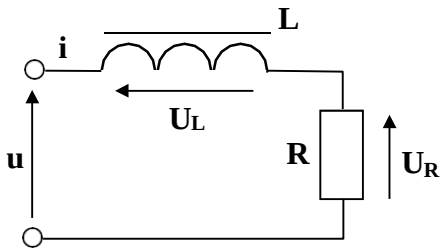


Ex. 3.
Reduce the block diagram and determine the equivalent transfer function of the system.



Linearisation

Ex. 4.
Given is an electric circuit (a resistor and a coil with a ferromagnetic core).



The voltage across the coil is given by the equation:

$$u_L = z\frac{d\phi}{dt}$$

where: z - number of coil turns
ϕ - magnetic flux excited by the current flow

The relation $\phi(i)$ is nonlinear and depends on the type of core. Let: $\phi(i) = \frac{i}{i+1}$ for $i > 0$.
Write the equation of this circuit and perform its linearisation at the equilibrium point: $i_0 = 1$, $u_0 = 10$ $((di/dt)_0 = 0)$.

Zad. 5.

The system is described by the equation:

$u = h\sqrt[3]{y}$, where y is the output, while h is constant.

Perform linearisation of this equation around the operating point u_0, and determine the equation of the static characteristic.