

**THE ANALYSIS OF THE EXISTING METHODS FOR ASSESSING THE
SENSITIVITY OF THE TRANSFER FUNCTIONS ROOTS TO CHANGES
IN THEIR COEFFICIENTS**

It is very important to research all impacts that can cause incorrect work of digital control systems because of the thorough introduction of them in electromechanics. The existence of the problem of impact of the finite hardware precision in digital control systems which significantly influences their practical realization was shown in previous works. The explanation of this phenomenon can be found in publications on applied mathematics. It is shown there that polynomials with multiple or close roots are very sensitive to the transfer function coefficients accuracy. Decreasing of sampling step leads to the displacement of all zeroes and poles of the discrete transfer function to a unity. So, all solutions of the polynomials in the numerator and denominator become very close. Consequently, polynomials become singular and, as a result, very sensitive to the coefficient resolution accuracy.

According to this, it is very important to make the analysis of the existing methods for assessing the sensitivity of the polynomials roots of the transfer functions to changes in their coefficients and to describe the basic mathematical equations for assessing the sensitivity of the polynomials roots of the transfer functions to changes in their coefficients.

The existing methods for assessing the sensitivity of the polynomials roots of the transfer functions to changes in their coefficients were analyzed in this article. Particular attention was paid to the case of the multiple polynomials roots of the transfer functions, leading to a drastic impact of the slightest error in polynomial coefficients on result of their roots finding. The basic mathematical equations for assessing the sensitivity of polynomials roots of the transfer functions to changes in their coefficients were described.

The conducted analysis has shown that there are a few methods for assessing the sensitivity of the polynomials roots of the transfer functions to changes in their coefficients and has confirmed the actuality of searching the ways of solving the problem of impact of the finite hardware precision on the practical realization of digital control system. The analysis of publications has shown that the problem of discrete transfer functions for the small sampling step is still unsolved.