Abstract

The purpose of our research is to investigate the electronic filters designed for communications circuits. We are developing new approach to the filter design, the approach that can be understood and implemented by engineering-technology students. In this project we have concentrated at the family of Chebyshev filters that belongs to the group of elliptic filters. The main goal in filter design is obtaining its desired amplitude and phase responses along with time group delay—the major characteristics of the filter—within required tolerances. This is what we have done in this phase of our research. Specifically we have found a general equation for the transfer function of a Chebyshev 1 filter, determined the poles of this filter, and by plugging the calculated poles, we obtain the transfer function, $H(\omega)$, of this filter in explicit form. To check the correctness of our operations, we compare the denominator of this function with that given in literature as Chebyshev polynomials. Then we have obtained the amplitude response, $|H(\omega)|$ and the phase response, $\Theta(\omega)$, from $H(\omega)$. We have also derived the expression for a group delay from the formula for the phase response. Finally, we have built the graphs of amplitude and phase responses and group delay. In this work we also investigated how the filter order and the ripple factor affect the amplitude response of this group of filters.