

ABSTRACT

In this research, many novel expressions for time domain responses of fractance device to various often cited inputs have been proposed. Unlike the previous ones, our expressions have been derived based on the Caputo fractional derivative by also concerning the dimensional consistency with the integer order device based responses and the different between two types of fractance device i.e. fractional order inductor and fractional order capacitor. These previous expressions have been derived based on the Riemann-Liouvielle fractional derivative which has certain features that leads to contradictions and additional modeling difficulties unlike the Caputo fractional derivative. Our new expressions are applicable to both fractional order inductor and capacitor with arbitrary order. They are also applicable to any subject which its electrical characteristic can be modeled based on the fractance device. With our expressions and numerical simulations, the time domain behavioral analysis of both fractance device and such subject can be directly performed without requiring any time to frequency domain conversion and its inverse as already presented in this work. Therefore our work has been found to be beneficial to various fractance device related disciplines e.g. biomedical engineering, control system, electronic circuit and electrical engineering etc.