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Fractional Order Multifunction Filter with 3 Degrees of Freedom

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Abstract: In this paper the design procedure and performance of the third order multifunction filter based on Current Differencing Buffered Amplifier (CDBA) using Fractional Elements of Different Order (FOE) is presented. Three fractional elements of different order α, β, γ are used and peak value frequencies and cut-off frequencies are computed for the multifunction filter from the fractional order transfer function. The frequency response of the filters is obtained using FOMCON toolbox of MATLAB and also with PSPICE using fractional order elements. Stability and sensitivity analysis are also examined. The Power dissipation, Total Harmonic Distortion (THD), and Noise Analysis demonstrate a very good agreement between the theoretical and simulation results. It is also observed from the simulations that the CDBA based third order multifunction filter in fractional domain is suitable for integrated circuits.

Keywords: Current Differencing Buffered Amplifier (CDBA), Fractional Order Element (FOE), third order filter.

1. Introduction:

Many signal processing applications such as in Fractional Order Filters [1-14], Oscillators [15-18], Multivibrators [19], Integrators [20], Differentiators [21-22], [32] etc. based on fractional order calculus has gained great attention of many researchers. Resistor, capacitor and inductor are the key components to realize active and passive integer order filters in the