

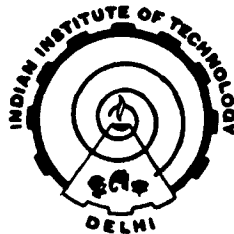
ANALYSIS, SYNTHESIS AND APPLICATIONS OF SWITCHED CAPACITOR CIRCUITS

By

MANEESHA GUPTA

Department of Electrical Engineering

***THESIS SUBMITTED
IN FULFILMENT OF THE REQUIREMENTS FOR
THE AWARD OF THE DEGREE OF
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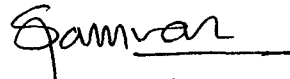
FEBRUARY, 1990

DEDICATED TO MY SON ANEESH

CERTIFICATE

This is to certify that the thesis entitled, "ANALYSIS, SYNTHESIS AND APPLICATIONS OF SWITCHED CAPACITOR CIRCUITS," being submitted by Maneesha Gupta to the Department of Electrical Engineering, Indian Institute of Technology, Delhi, for the award of the degree of Doctor of Philosophy is a record of bona fide research work carried out by her under my supervision and guidance and that in my opinion, it has reached the standard fulfilling the requirements of the regulations relating to the degree.

The results contained in this thesis have not been submitted to any other university or Institute for the award of any degree or diploma.



(S. S. Jamuar)

Astt. Professor,

Department of Electrical Engineering,
Indian Institute of Technology, Delhi,
New Delhi - 110016, INDIA.

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ABSTRACT

The investigation in this research work is primarily concerned with the analysis, synthesis and filtering and non-filtering applications of Switched Capacitor (SC) circuits. Some new techniques for the analysis and synthesis of SC circuits have been presented. A few non-filtering applications of SC circuits as oscillators, programmable amplifiers, filters and phase shifters have also been suggested.

An additional set of equivalences for five more commonly used SC element, which are complementary to those of Zhou, have been proposed. Traditional circuit analysis can then be used to derive z-domain transfer function of the filter using these two sets. This makes the analysis simple and similar to the method used in s-domain. Using Zhou's [13] approach, a generalized SC element (GSC) has been proposed which is then used to realize generalized SC networks of first, second and third orders. Some known circuits have been rederived to demonstrate the efficiency of this technique. Two techniques based on the expansion of the z-domain transfer function into a Cauer form for the synthesis of SC ladder filter by continued fraction expansions (CFEs) in the z and modified z-domains are proposed. The resulting structures are implemented using appropriate SC blocks. A new technique for the analysis and canonical realization of SC filter in the modified z-domain is also proposed. The method is based on the evaluation of the transfer function of the signal flow graph (SFG) with only one forward path and several feedback paths. The design procedure is carried out directly in the modified z-domain. Another approach for the design of SC filter in modified z-domain with a proper mix of positive and negative feedbacks is proposed. Design of some new SC oscillators based on three different configurations are suggested. These have been obtained by replacing the resistances in active-R and RC oscillators by their SC equivalents. Programmable circuits (amplifier, filter and phase shifter) have been obtained using phase locked loops and programmable counters. All these circuits have been breadboarded and the experimental results, verify the theory developed in this thesis.

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CERTIFICATE

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