CHAPTER : VIII

SUMMARY AND CONCLUSIONS

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8.1 SUMMARY :-

This chapter is devoted to the general discussions of present work.

In this dissertation Chapter-I represents extensive survey of literature in order to represent entire development of electrical filters. A discussion on basic filters and classifications is included. The filters are classified in a number of ways such as anolog or digital filters. Analog filters are further divided in to passive or active filters depending on the type of elements used in their realization. Filters are also classified according to functions they perform as low pass, high pass, bandpass, band reject amplitude equlizers and delay equilizers. There are same limitations in passive filters. The active filter consist of operational amplifier along with RC network in a feedback configuration. Providing high 'Q' networks. These inductorless filters provides very sharp filtering action. They are light in weight, comapct, economical and free from loading effect.

These filters have some drawbacks such as finite bandwidth of the active devices. Recently there has been a great interest in the designing of active -R filters which are based on single pole integrator model of the operational amplifier. The filter circuits using OP-AMPS and resistor as only external component are known as Active - R filter. Such circuits have many advantages such as high frequency operation, miniturization, ease of design and tunability.

The Chapter - II deals with the theorotical aspects of filters. In this topic designing of higher order filter is discussed. The cascade structures have higher sensitivity than coupled bi-quad structure. The various types of sensitivities are also discussed. In order to obtain the ideal response, some approximations are used in the filter designing. They are Butterworth (maximum flat response), Chebyshew (equiripple), Elliptic and Bessel (maximum flat delay response). For designing low pass, high pass, band pass filters transformation tecnique is useful for designing higher order filters. Also it provides a circuit with less sensitivity as compare to other filter realizations. At the end of chapter the filter topology is discussed. This is im,portant for the selection of a filter circuit.

The Chapter III explains overall idea abcut sensitivity. The sensitivity considerations are explained in this topic.

A new Active - R bi-quadratic filter based on single pole integrator model is presented in Chapter IV. This filter circuit consist of three operational amplifiers and three resistances. To control the feedback non-inverting terminal of operational amplifier is tapped at the centre. The circuit is multiple feedback circuit which realizes four bi-quadratic filter functions as low pass, high pass, band pass, and band stop. The various sensitivities of this circuit are calculated and found to be less than one.

Similarly, the study of response of the same circuit with variations of 'f_o' is discussed in Chapter V. The response is studied for Q = 1, A = 15 and Fo = 30 KHz, 50 KHz, 70 KHz, 120 KHz for all filter functions. A theorotical curve is also included in each case. In this case also the performance of circuit is quite satisfactory except for band stop action.

The study of response of the new active R filter circuit with changing in tapping point parameter (A) is discussed in Chapter VI. The response of the circuit was studied for F_o = 10 KHz, Q = 1 and different

tapping parameter.

A = 0.2., 0.4, 0.6, 0.8.

The response of the circuit was studied for center frequency F_o = 10 KHz and variation of Q = 1, 1,5, 2, 2.5 is discussed in Chapter VII. The frequency response was studied up to 1 MHz. From the response curves it is found that there is satisfactory agreement between theorotical and experimental observations. It gives high gain in pass band. The circuit is quite satisfactory as for as low pass, high pass, and band pass responses are concerned. In theorotical curve there is slight peaking near the central frequency F_o = 10 KHz. The performance is not so satisfactory in case of band stop response.

The behaviour of circuit is satisfactory for low pass, high pass and band pass action but band stop response is poor. Practically it is found that variation of 'A' has no effet on the response.

Further the theorotical curve shows a peak near the design frequency while observed responses show no peak at all except for band pass case. There is a departure at low and high frequencies which might be due to high and low gains of OP-AMPS in these regions. The overall performance of the circuit is good and satisfactory over the entire frequency range.

8.2 CONCLUSIONS :-

In this dissertation a new Active - R bi-quadratic filter circuit is proposes. It provides a very satisfactory response for all filter functions except for band stop action. The circuit is studied in detail with variation in Q, F_o and tapping parameter (A). It is observed that the response is quite satsifactory in all cases and design frequency (F_o) matches with the observed results. The gain is very high in pass band for low pass response.

It is found that for lower values of Q the circuit is not practically realizable. It is noted that a theorotical curve shows a small peak near the design frequency (F_o) while the observed responses do not show a peak at all. However, there are some degradations at low and high frequencies. The performance of a new circuit was studied from 50 Hz to 1 MHz. It is found that there is a departure at low and high frequencies which might be due to high and low gains of the operational amplifiers, in these regions.

FURTHER INVESTIGATIONS :-

The bi-quad circuit discussed in this dissertation, although provides some advantages it alos has some degradations in response.

1. The band stop action is not satisfactory in all cases.

2. In all filter functions theorotical curve shows a small peak near the designed frequency.

3. The variation of Q and tapping point parameter(A) have little effect on responses.

All these short comings observed in the response curves are being studied so as to find the exact cause of these deviations and to improve the performance of circuit.