CHAPTER : VII

STUDY OF RESPONSE OF CIRCUIT WITH VARIATION OF Q

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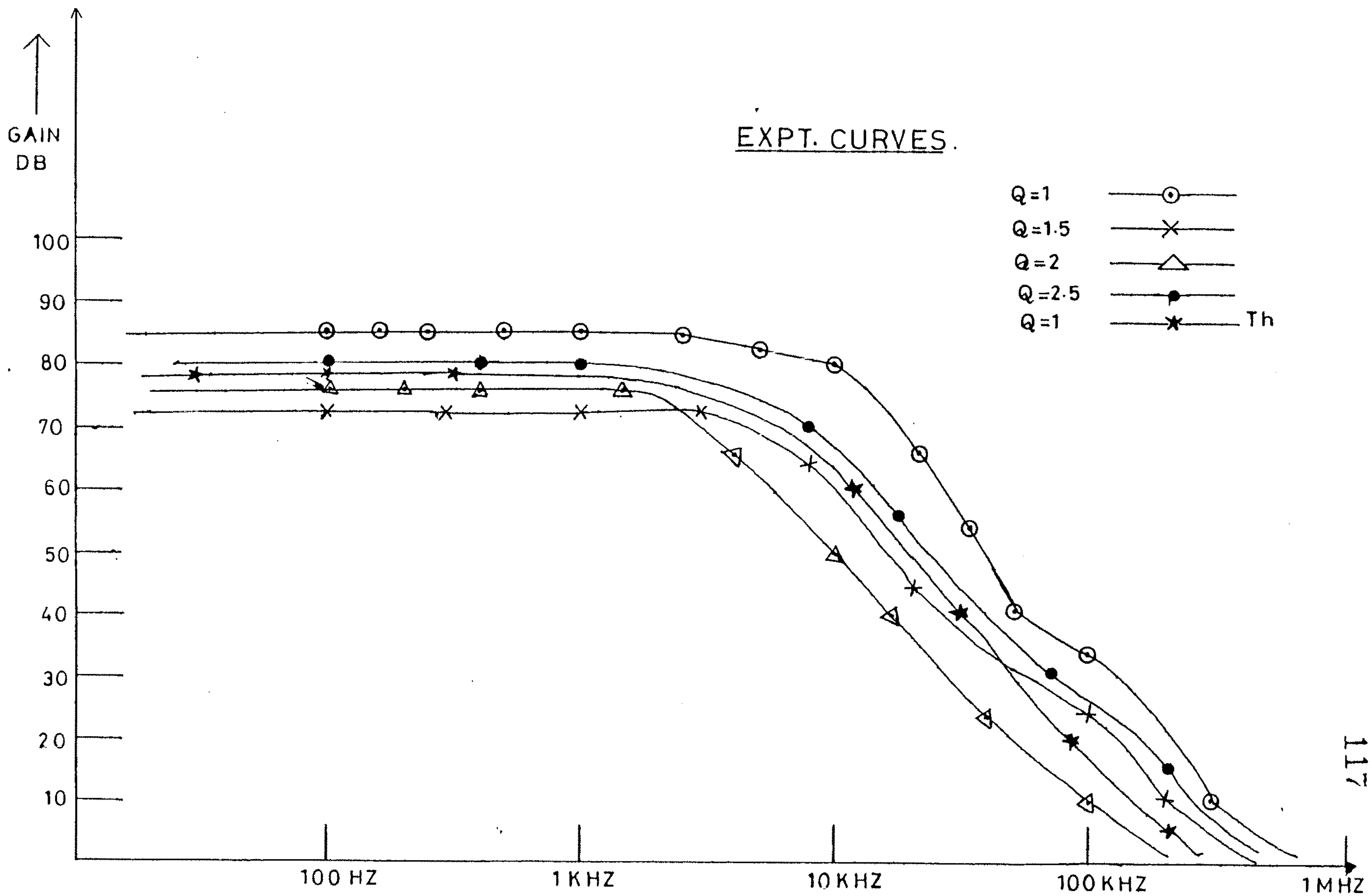
7.1 CIRCUIT AND EXPERIMENTAL STUDY :-

The same circuit was designed by using commonly available operational amplifier IC 741. The circuit described in the previous chapter is further studied with variation in Q. The transfer functions and design procedure is exactly same as described in chapter V.

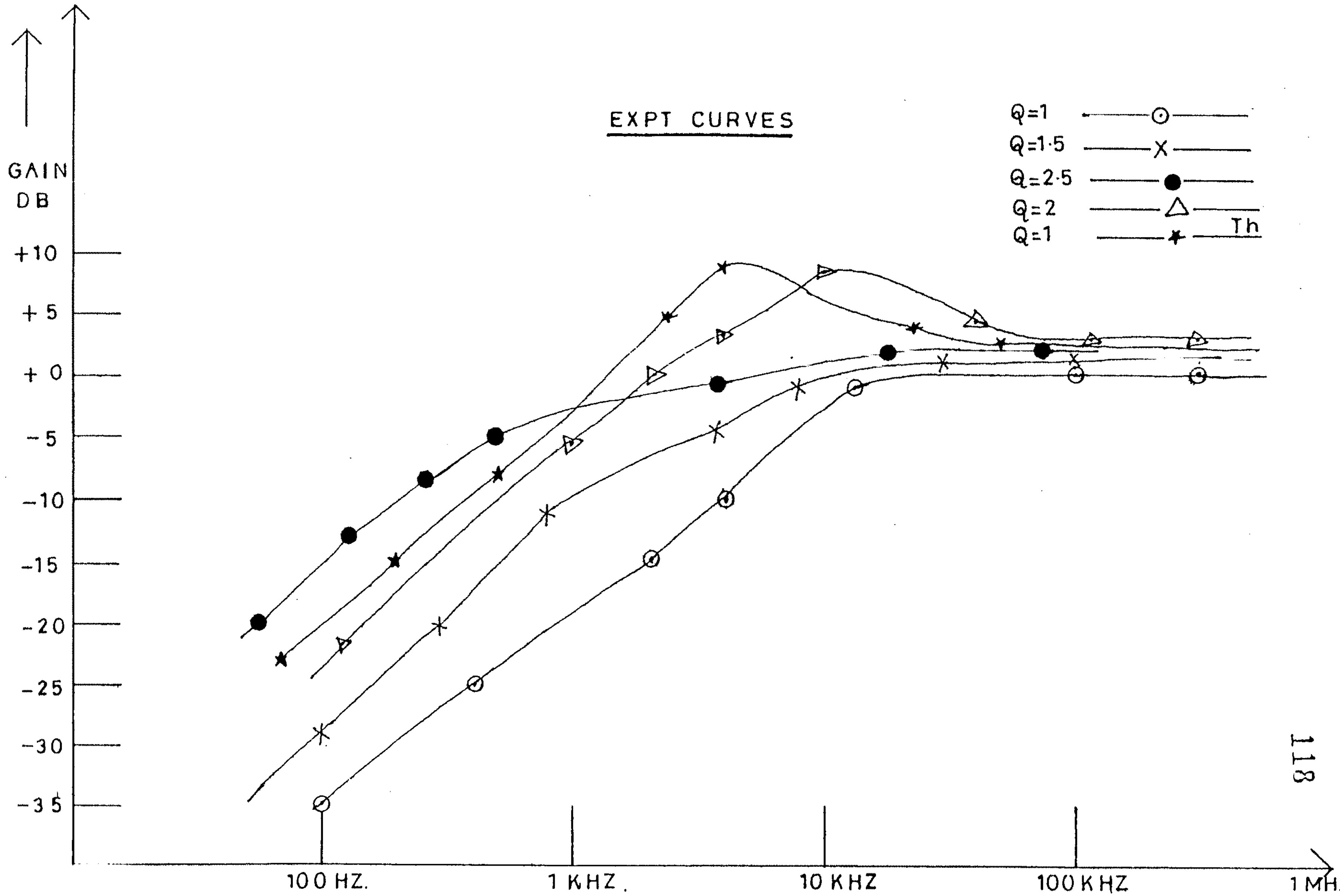
The frequency response is studied up to 1MHz. For this study F_o = 10 KHz, A = 0.5, and Q values are Q = 1, 1.5, 2 and 2.5. The various components are calculated.

The calculated values and actually used values are given in table (7.1)

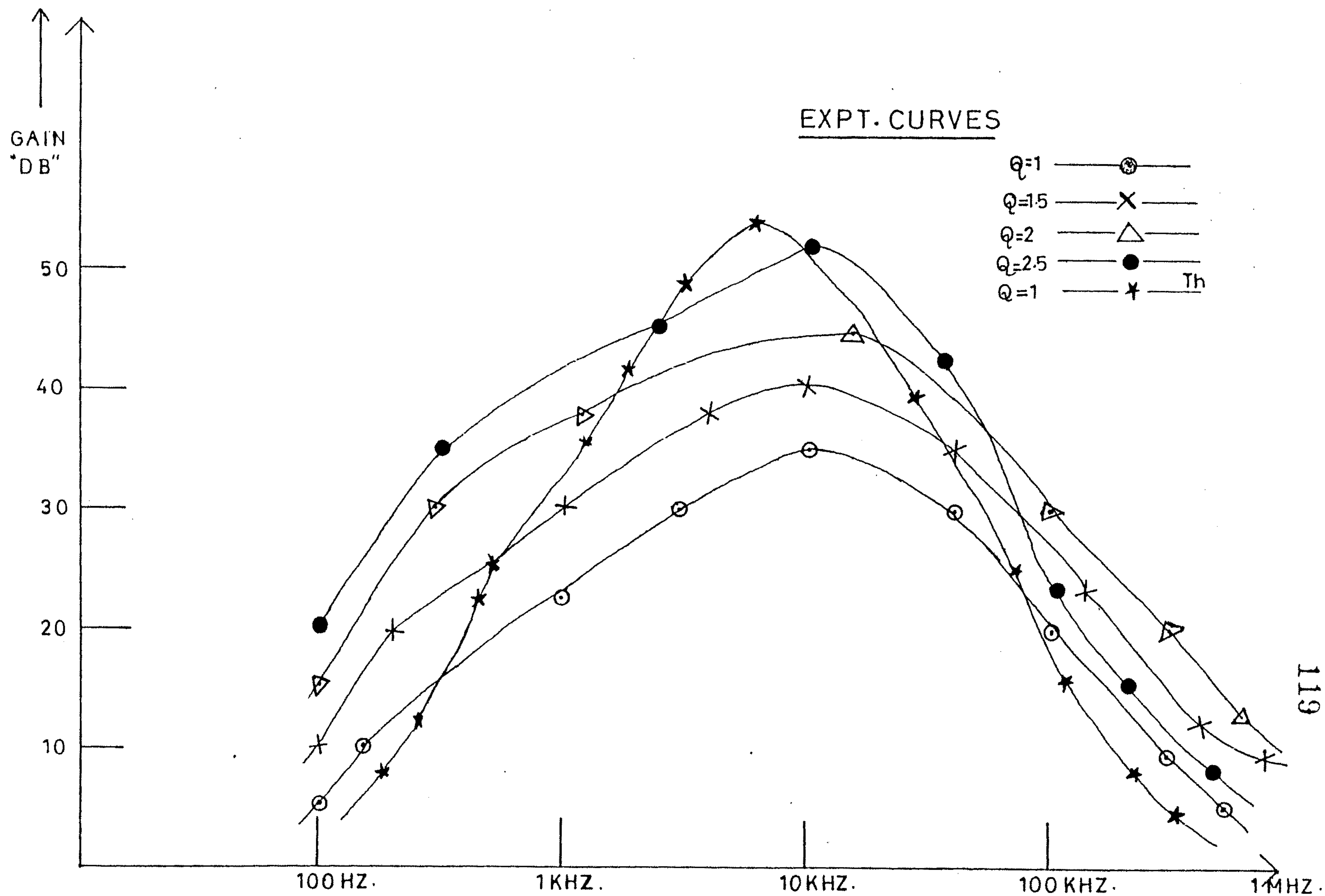
The results are graphically shown in fig. (7.1), (7.2), (7.3) and (7.4). A theorotical curve is also included for comparision in each case.



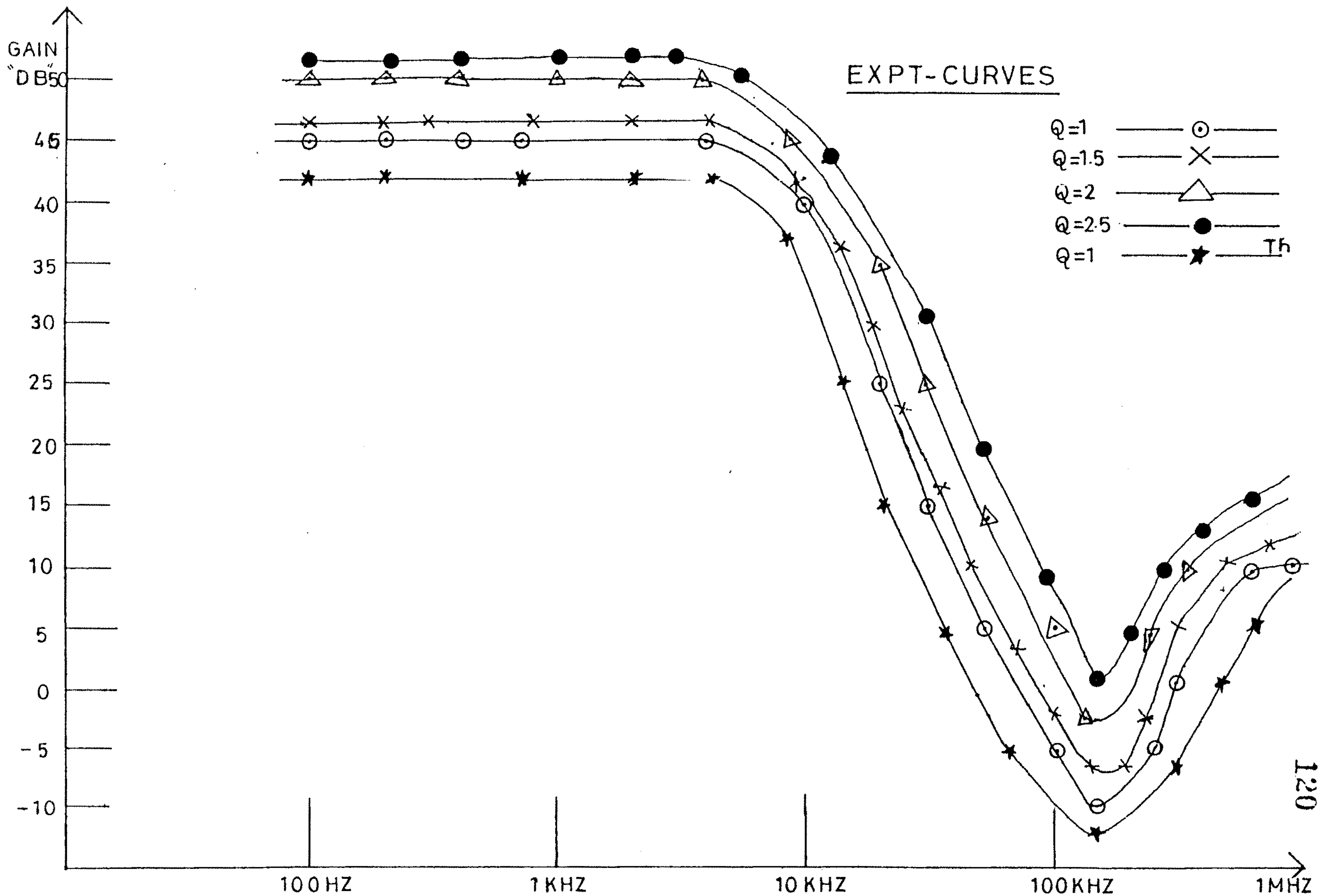
(Fig. 7.1) LOW PASS RESPONSE, Fo.=10 KHZ, & DIFFERENT 'Q', A=0.5



(Fig 7.2) HIGH PASS RESPONSE FOR F_o=10 KHZ & DIFFERENT 'Q' A=0·5



• Fig 7.3 : BAND PASS RESPONSE FOR F_o = 10 KHZ & DIFFERENT Q   A = 0.5



(• Fig 7.4) BAND STOP RESPONSE FOR F=10 KHZ, & DIFFERENT Q, A=0.5

7.2 RESULTS AND DISCUSSION :-

(A) LOW PASS RESPONSE :-

The low pass response is shown in fig.7.1 It is seen that overall response is quite satisfactory. The frequency response curves for different values of 'Q' with center frequency F_o = 10 KHz are shown. A theorotical response is also plotted for Q = 1. It is noticed that the experimental results are in good agreement with theorotical observations. The observed center frequency is also in good agreement with design value for Q = 1. No over-shoot is observed any where in the response and the circuit has high gain (85 dB). The variation of Q has slight effect on the pass band gain. As Q changes from 1 to 2.5, the gain decreases from 84 dB to 72 dB in the pass band. The overall response is satisfactory.

(B) HIGH PASS RESPONSE :-

The high pass response is shown in Fig.7.2. In this case also the response is quite satisfactory and there is a very good agreement between theorotical and observes values for Q = 1. The cut-off frequency also agrees with designed values. As Q increases slight peaking is observed below 'F_o' value. The roll-off in the stop band is almost constant about 17 dB/decade.

The response is good above the designed frequency, of 10 KHz. The Q variation has very slight effect in the pass band. The circuit shows excellent frequency response from 200 HZ to 1 MHZ.

(C) **BAND PASS RESPONSE :-**

The band pass response is shown in (4.3). All the curves shows similar shape of maximum gain about 10 KHz, which is designed value. The gain increases with Q. The comparision of observed and theorotical curve for Q = 1, shows noticiable difference. The maximum gain for observed value is 35 dB at 10 KHz where as the theorotical curve peaks at 6 KHz with gain of 54 dB. As Q increases the gain also increases (on 35 dB to 52 dB) as Q changes from 1 to 2.5.

(D) **BAND STOP RESPONSE :-**

The band stop response is shown in fig. 6.4. It is observed that the curves are almost identical showing slight variation with respect to 'Q'. This may be due to small values of Q used for the circuit design.

It is noticed that there is no agreement between the design value of F_o and observed value. The curves are similar to the curves for low pass filters but show pronounced deep at about 150 KHz.

7.3 CONCLUSIONS :-

The New Active-R filter circuit is studied with variation in 'Q'. The experimental observations shows that the performance of the circuit is quite satisfactory. Some degrations are observed at the high frequency end of the response curve. This may be due to the lower gain of the operational amplifier which might have affected the overall feedback in the circuit.

In this study only low values of 'Q' were considered the limiting value being about 7.

F_o (KHz)	Tapping Point (A)	Q	Designed Values R_3	Designed Values R_2	Designed Values R_1	Experimental Values R_3	Experimental Values R_2	Experimental Values R_1
10	0.5	1.0	13.30 K	815.20 K	100 Ω	13.30 K	815.20 K	100 Ω
10	0.5	1.5	20.50 K	620.30 K	100 Ω	21.00 K	625.30 K	100 Ω
10	0.5	2.0	30.50 K	545.10 K	101 Ω	30.50	540.10 K	101 Ω
10.	0.5	2.5	33.50 K	440.30 K	100 Ω	32.50 K	440.10 K	100 Ω

Table 7.1 The Designed and Experimental Values of Resistances.