EXPERIMENT NO. 8

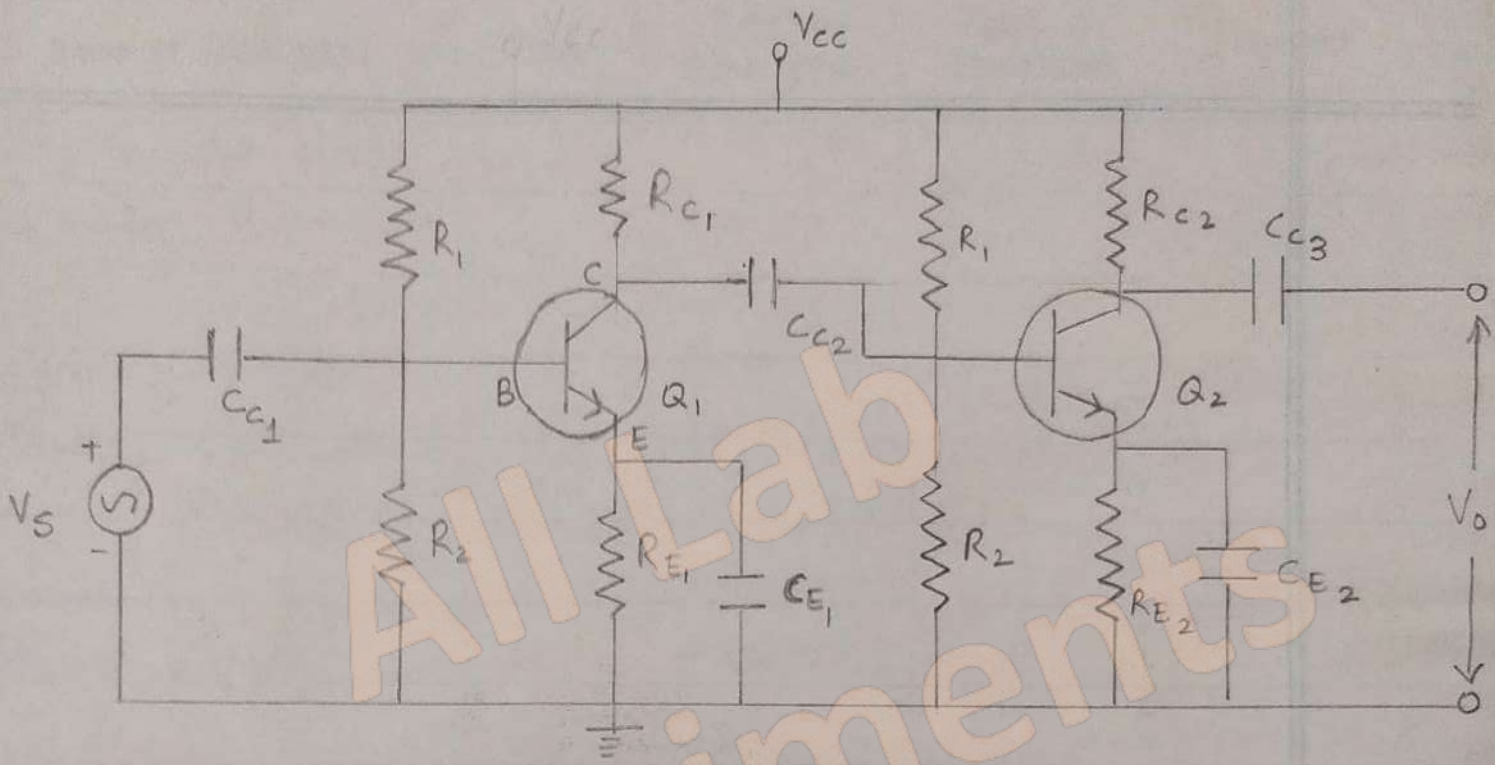
AIM → To obtain the frequency response characteristics of a single stage R-C coupled amplifier with and without feedback.

APPARATUS → Experimental Board on R-C coupled amplifier, multimeter, AF signal generator, CRO.

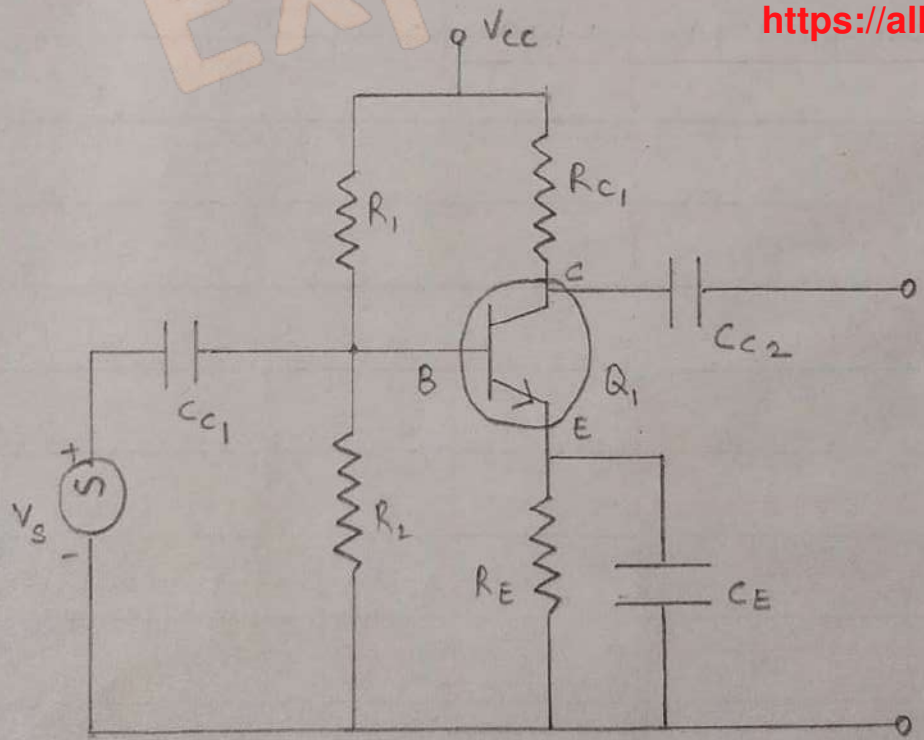
THEORY → Most of the small signal low power amplifiers at low or high frequencies make use of the R-C coupling between stages. This type of network does not couple the DC output of one stage to the other but it modifies the frequency response of the amplifier.

Capacitors C_{C_1} and C_{C_2} are known as the coupling capacitors. Capacitor C_{E_1} is known as the emitter by-pass capacitor and it along with the coupling capacitor affect the low frequency response of the amplifier. The resistors R_1, R_2 and R_{E_1} decide the DC operating point and the bias stability.

CIRCUIT DIAGRAM FOR R-C COUPLED AMPLIFIER.



CIRCUIT DIAGRAM FOR A CE AMPLIFIER.



Frequency Response → A plot of voltage gain as a function of frequency is called the frequency response of an amplifier. The gain of this circuit is not same for all frequencies. The curve can be divided into three parts :-

(i) Low - frequency Region
(ii) Mid - frequency Region
(iii) High - frequency Region

At mid frequencies, all high value capacitors can be treated as short - circuits, whereas the small capacitances may be treated as open - ckts. The whole circuit is purely resistive and mid - frequency voltage gain is given by

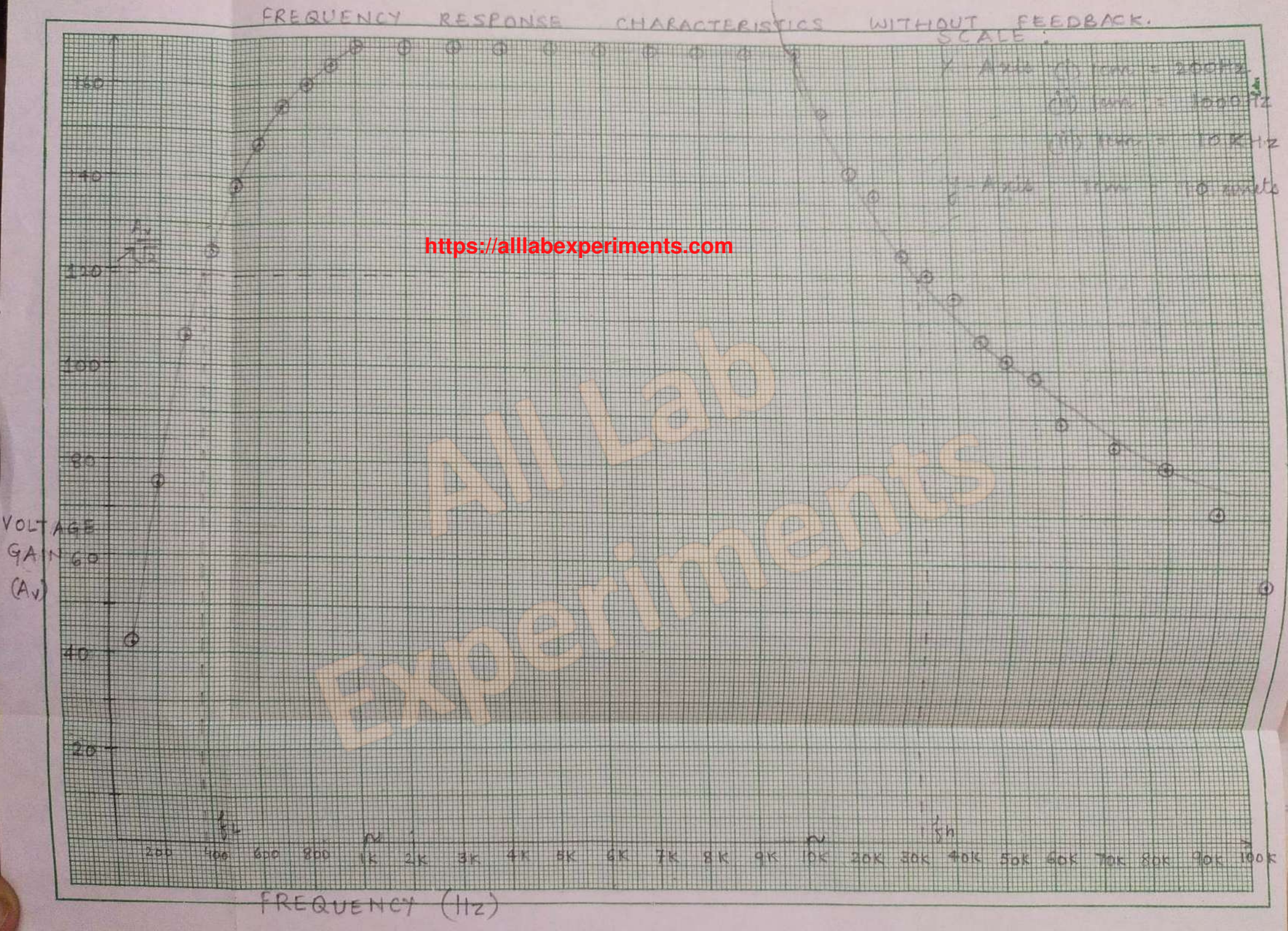
$$A_V(m) = \frac{A_I(m)\, R_L}{R_1}$$

PROCEDURE → 1. Draw the circuit diagram.

2. Give the input signal and get the output signal first without feedback.

3. Vary the frequency over the entire range and note the corresponding freq voltage.

FREQUENCY RESPONSE CHARACTERISTICS WITHOUT FEEDBACK.



4. Repeat the same procedure with feedback.

OBSERVATION TABLE →

(i) Frequency Response without feedback.

FREQUENCY (Hz)	VOLTAGE (V)	FREQUENCY (Hz)	VOLTAGE (V)
50	1.05	6K.	7.6
100	1.9	8K.	7.6
200	3.4	10K.	7.6
250	4.0	15K	7.0
300	4.8	20K	6.4
350	5.0	25K	6.2
400	5.6	30K	5.6
450	6.0	35K	5.4
500	6.2	40K	5.2
550	6.4	45K	4.8
600	6.6	50K.	4.6
~~7800~~ 700	7.0	55K	4.4
800	7.2	60K	4.0
900	7.4	70K	3.8
1000	7.6	80K	3.6
2K	7.6	90K	3.2
4K.	7.6	100K	3.0

(ii) Frequency Response with feedback.

FREQUENCY (Hz)	VOLTAGE (V)	FREQUENCY (Hz)	VOLTAGE (V)
500	0.54	50K	0.34
1K.	0.54	60K	0.30
2K	0.54	70 K.	0.28
9K.	0.52	80 K.	0.26
20K	0.46	90 K.	0.24
25K	0.42	100K.	0.20
30K	0.40	150K.	0.16
35K	0.38	200 K.	0.14
40K	0.36	300K.	0.12.

RESULT → The frequency response of an R-C coupled Amplifier without feedback is as shown. This is in close approximation with that required.

PRECAUTIONS → 1. Keep the hands away from transformer.
2. Do not make interconnections with power supply on.
3. Input signal should be constant for one set of readings.

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DISCUSSION ⟶ In this experiment, we actually operate on a CE Amplifier and not an RC coupled amplifier. This is because in RC coupled two CE amplifiers are in cascade such that the output of one CE amplifier acts as the input of other CE amplifier in the RC coupled ckt. As a result, the total output is amplified to a larger extent such that its ends go in cut-off or saturation region the output is clipped-off.