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[EXPERIMENT]

Aim: Study of RC coupled common emitter (CE) transistor amplifier & determination of its gain, bandwidth & signal handling capacity.

Apparatus Used: Multimeter, bread board, 12 V DC power supply, function generator, CRO, Resistors (R_1: 68 kΩ, R_2: 15 kΩ, R_C: 1.2 kΩ, R_E: 1 kΩ), Capacitors (C_{in}, C_{out}: 1 μF, C_E: 33 μF), Transistor no.: BC548 (NPN)

Theory: An amplifier is a device that is used to amplify input voltage or current. The RC coupled CE transistor is a popular scheme of cascading two or more amplifiers to achieve the required level of amplification. The inter-stage coupling is done by using a RC network, hence the name. The variation gain with frequency of an amplifier is called the frequency response characteristics of the amplifier.

The bandwidth of the RC amplifier is the difference between upper cut-off frequency & lower cut-off frequency. It represents the range of frequencies that the amplifier is most effective in amplifying. The cut-off frequency points are determined from the frequency response graph, where the gain (dB) is 3 dB lower than the max gain.

For a transistor to act as an amplifier, it must be properly biased i.e. its emitter base junction must be forward biased & collector base junction must be reverse biased. The transistor is operating in the active region, is verified by measuring the DC bias voltages.

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Methodology :-

The components are connected as shown in the figure.

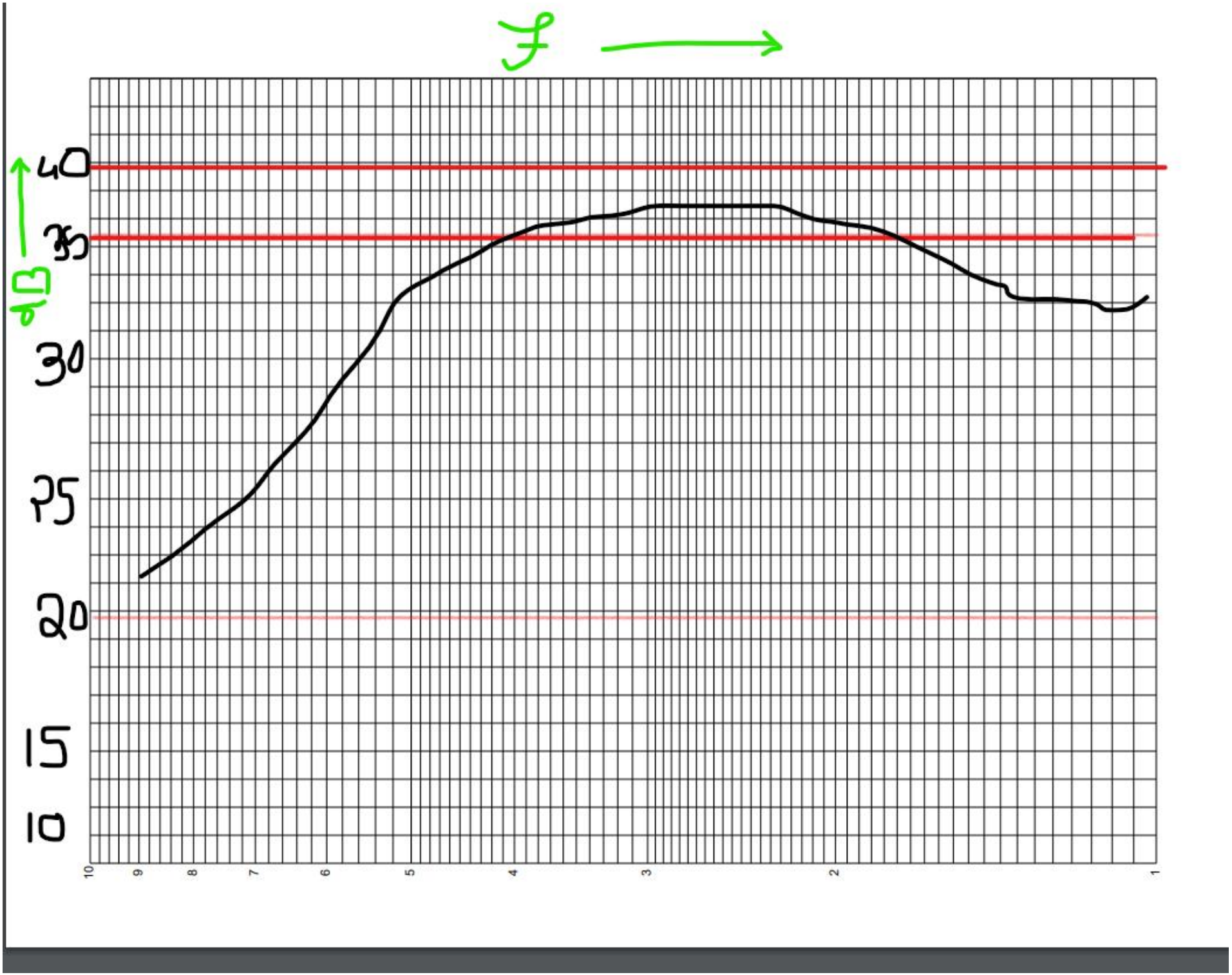
1. A 50 mV peak to peak signal from the function generator to the input of the Amplifier & voltage output is measured in the CRO. Note down the V_{p-p} readings for different frequencies keeping the input signal constant.
2. The voltage gain in dB for each frequency & plot the frequency response curve in a semi-log graph paper. From that find the bandwidth.
3. Signal Handling Capacity :- In the mid frequency, select any frequency, go on increasing the input, observing the output in the oscilloscope. At some value of input, the output waveform starts showing distortion. That input value in volts or mV is called the signal handling capacity.

Teacher's Signature

Experimental Results :

V_{CC} = 8.28V , V_{BE} = 0.67 V, I_C = 1.99 mA , V_{RC} = 2V

Vin	Frequency (f)	V_{out} (in volt)	Gain (V_{out}/V_{in})	Gain in dB = 20 log (V_{out}/V_{in})
	50Hz	0.499	10.08	20.06
	100Hz	0.948	19.04	25.58
	500Hz	2.16	43.2	32.70
	1kHz	2.64	52.8	34.45
	5kHz	2.82	56.4	35.02
50 mV	10kHz	3.0	60.0	35.56
V_{pp}	20kHz	3.2	64.0	36.12
	50kHz	3.2	64.0	36.12
	100kHz	3.2	64.0	36.12
	200kHz	3.2	64.0	36.12
	500kHz	2.96	59.2	35.44
	700kHz	2.56	51.2	34.19
	1MHz	2.32	46.4	33.33
	2MHz	1.44	28.8	29.19
	5MHz	0.72	14.4	23.15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