TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

PURWANCHAL CAMPUS

Dharan-8

A Lab Report On: To Study the operation of Log Amplifier

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TITLE: TO STUDY THE OPERATION OF LOG AMPLIFIER

APPARATUS REQUIRED

1. Log/Anti-Log Kit

THEORY

A logarithmic amplifier is an amplifier whose O/P is proportional to the natural log of the input.

$$\text{i.e. } V_o = K_1 ln(K_2 V_{in})$$

Where K_1 and K_2 incorporate the effects of various circuit elements such as reference voltage and resistors. IN designing a log amplifier, an Op-Amp as LM741 is used with additional Op-Amps often included for compensation. A standard high dynamic range log amplifier is shown in fig below:

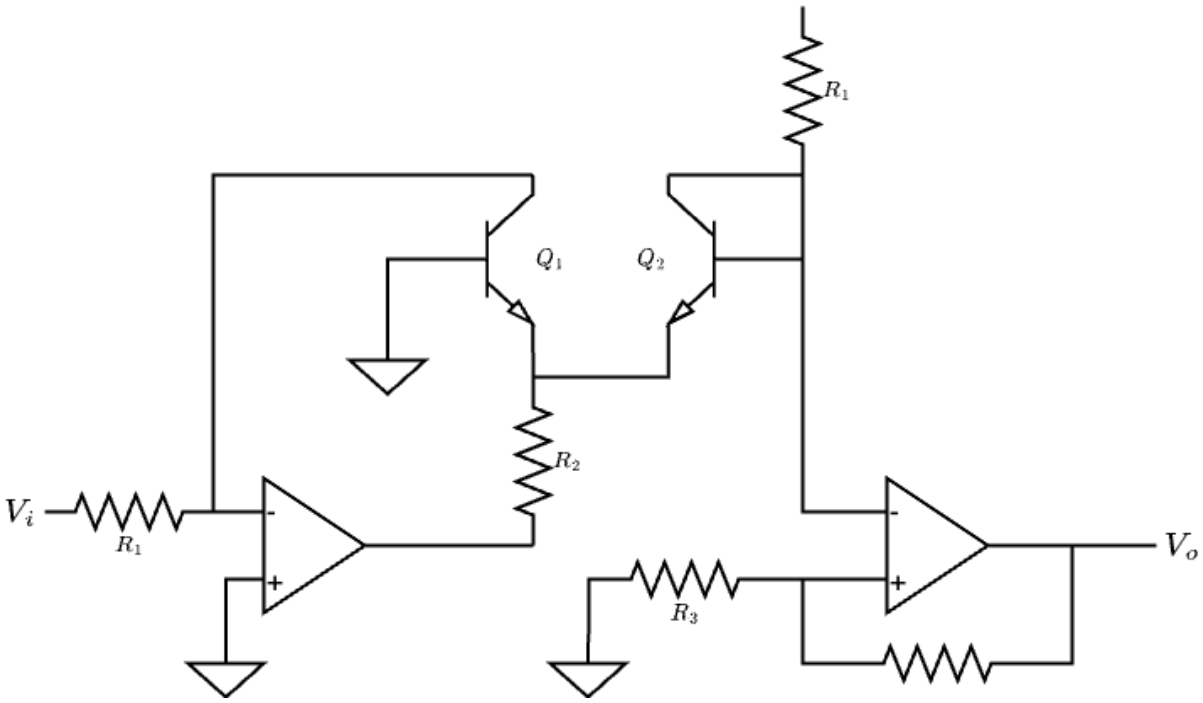


Fig: Log Amplifier

The transistor Q_1 and Q_2 must be biased in active region. The collector current must be positive which implies that i_1 and V_i must be positive. It can be shown that the O/P Voltage of log amplifier is

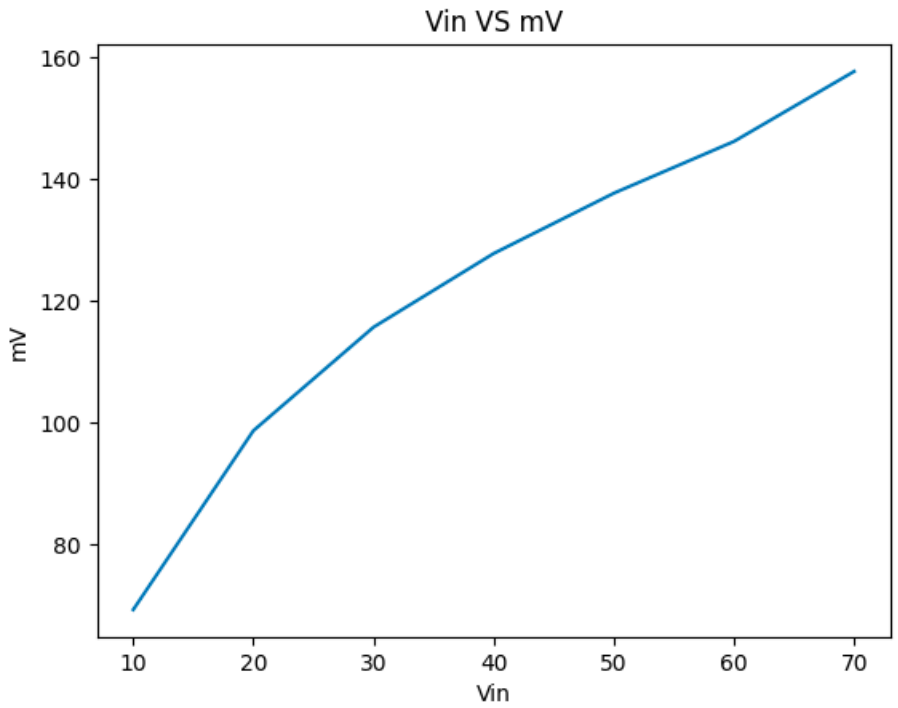
$$V_o = -V_T \left(1 + \frac{R_4}{R_3}\right) \left(ln \left[\frac{V_i}{R_1} \frac{R_2}{R_1}\right]\right)$$

Experimentally, the circuit performs the log function over approximately four orders of magnitude of the input voltage, generally in the range of 2mV to 20V

OBSERVATION

SN	Applied Input Voltage V_{in} (mV)	O/P Voltage V_{out} (mV)	-ln (V_{in})
1	10	69.2	-2.302
2	20	98.6	-2.995
3	30	115.6	-3.401
4	40	127.7	-3.688
5	50	137.6	-3.912
6	60	146.1	-4.094
7	70	157.6	-4.248

GRAPH



DISCUSSION AND CONCLUSION

During this experiment, we observed that the log amplifier we built gives a non-linear response to the input signal which is due to transistor in the circuit. It compromises the input signal logarithmically. As a result, the O/P of the circuit increases slowly at I/P signal level and rapidly at high input signal levels.

In conclusion, the lab of logarithmic amplifier helps to know about signal processing and measurement application that will further help us to design better circuit