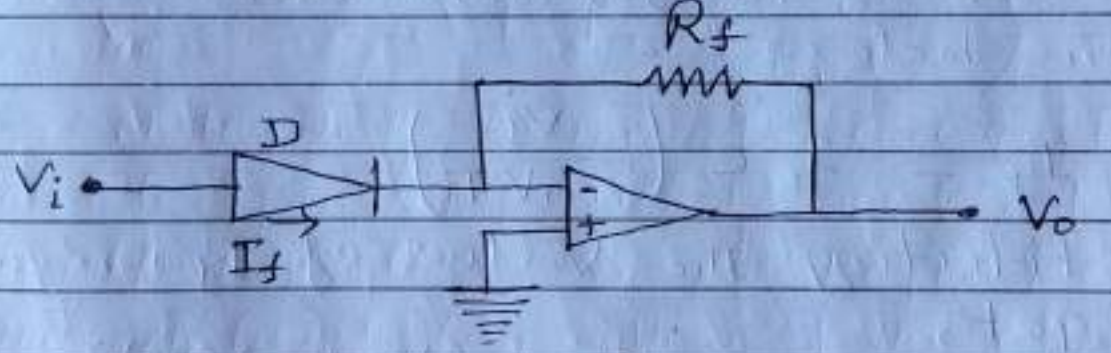
VKSU

Anti logarithmic (exponential) Amplifier

An anti-logarithmic amplifier or an anti-log amplifier is an electronic circuit that produces an output i.e. proportional to the anti-logarithm of the applied input. This section discusses about the OP-amp. based anti-logarithmic amp. in detail.

An OP-amplifier based anti-logarithmic amplifier produces a voltage at the output, which is proportional to the anti-logarithm of the voltage i.e. applied to the diode connected to its inverting terminal.

The circuit diagram of an OP-amplifier based anti-logarithmic amplifier is shown in the following figure.



In the circuit above, the non-inverting input terminal of the OP-amp. is connected to ground. It means Zero Volts is applied to its non-inverting input terminal.

According to the virtual short concept the voltage at the inverting input terminal of OP-amplifier will be equal to the voltage present at its non-inverting input terminal. So, the voltage at its inverting input terminal will be zero volts.

The Nodal equation at the inverting input terminal node is

$$-I_f + \frac{0 - V_o}{R_f} = 0$$

$$\Rightarrow -\frac{V_o}{R_f} = I_f$$

$$\Rightarrow V_o = -R_f I_f \quad \text{——} (1)$$

We know that the equation for the current flowing through a diode, when it is in forward bias, is as given below —

$$I_f = I_s e\left(\frac{V_f}{nVT}\right)$$

Substituting the value of I_f in equⁿ (1) we get,

$$V_o = -R_f \left\{ I_s e^{(V_f/nVT)} \right\}$$

$$V_o = -R_f I_s e^{(V_f/nVT)} \quad \text{——} (2)$$

The KVL equation at the input side of the inverting terminal of the OP-amplifier will be

$$V_i - V_f = 0$$

$$V_f = V_i$$

Substituting, the value of in the equation we get

$$V_0 = -R_f I_s e^{(V_i/\eta V_T)}$$

Note that in the above equ^n the parameters η, V_T and I_s are constants. So, the output voltage V_0 will be proportional to the anti natural logarithm (exponential) of the input voltage V_i for a fixed value of feedback resistance R_f.

Therefore, the OP-amplifier based anti-logarithmic amplifier circuit discussed above will produce an output, which is proportional to the anti-natural (exponential) of the input voltage V_i, when $R_f I_s = 1V$.

observe that the output voltage V_0 is having a -ve sign. which indicates that there exists a 180° phase differe between the input and the output.