Unit -> 2

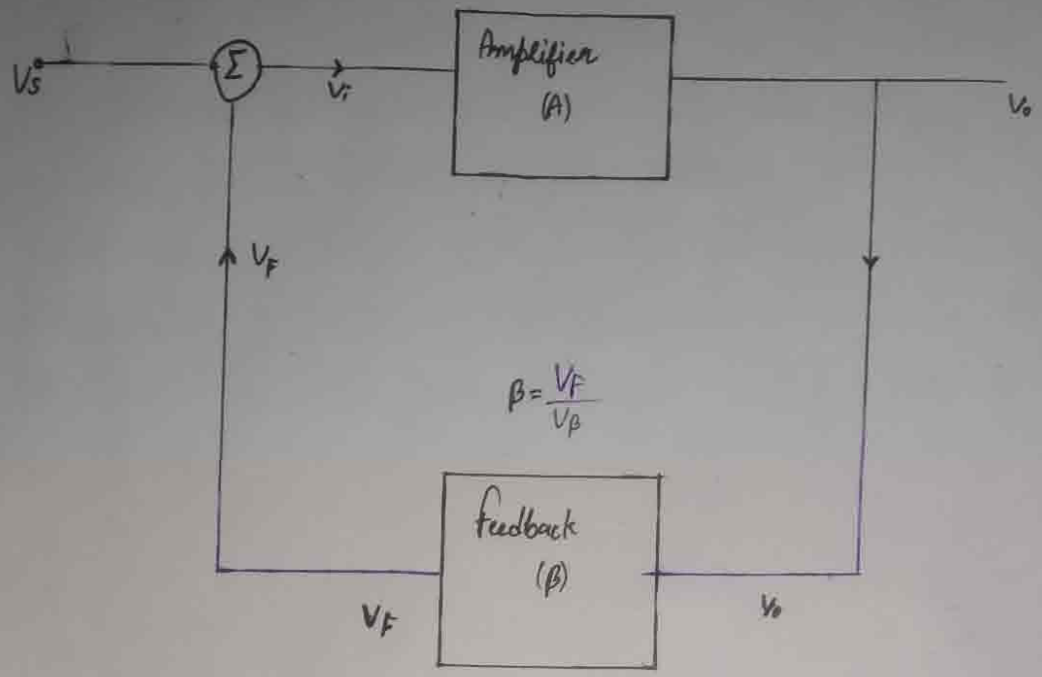
Subject -> Analog ckt

Faculty -> Dr. Nidhi chauhan

Paper code -> BT-402

Lecture 6 -> Effect of feedback on gain, banwidth

Effect of feedback on gain



$(V_F = \beta V_o)$

$A = \frac{V_o}{V_i}$ $\{V_o = AV_i\}$

$\{V_i = V_s \pm V_F\}$

$V_o = AV_i$

$= A(V_s \pm V_F)$

$= A(V_s \pm \beta V_o)$

$= AV_s \pm AB V_o$

$V_o \mp ABV_o = AV_s$

$$\frac{V_o}{V_s} = \frac{A}{1 \mp AB} = A_{V_F}$$

Effect of feedback On bandwidth

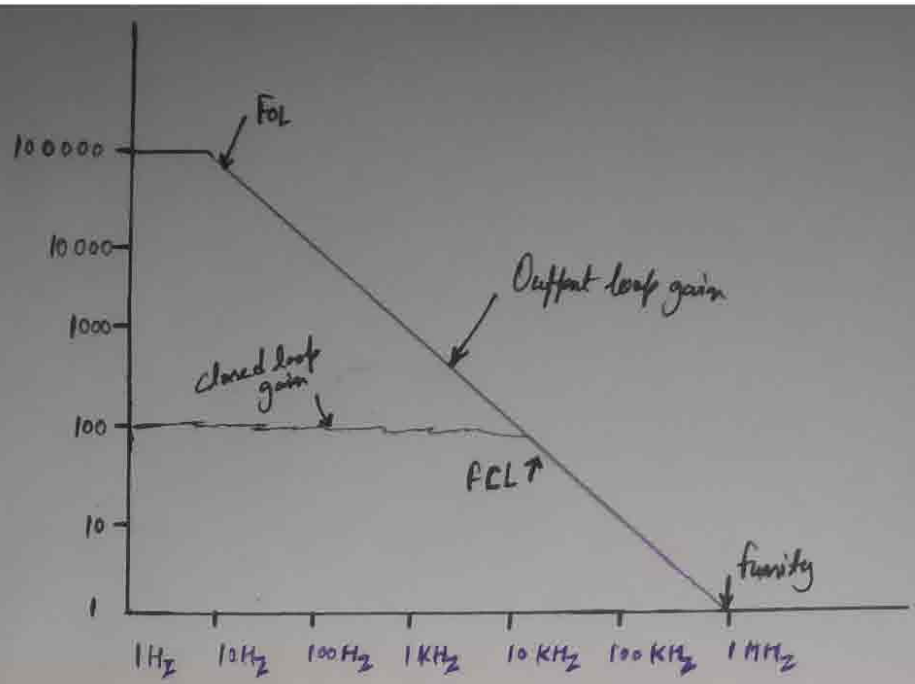
The Bandwidth of an amplifier is Defined as the range of frequencies for which the gain remains Constant. The gain Bandwidth product of an Op-amp is always a Constant. The gain of an Op-amp and its Bandwidth are Inversely proportional to One another. The Bandwidth of an Op amp Can be Increased by Providing feedback signal to its Input. The product of closed-loop gain and closed-loop Bandwidth is Same as the product of Open-loop gain and open-loop bandwidth. i.e.

$$A_F BW_{CL} = ABW_{OL}$$

The Op-amp 741 has Open-loop gain of 200,000 and a bandwidth of about 5Hz. Therefore, the product of its open-loop gain and bandwidth is.

$$ABW_{OL} = 200,000 * 5Hz = 1MHz$$

The open-loop gain-bandwidth product of 741 is 1MHz. the left-hand side of equation ① is the product of closed-loop gain and closed-loop bandwidth. no matter what the value of R_1 and R_f, the product of closed loop gain and closed loop bandwidth must equal the Open-loop gain-bandwidth product, i.e. for 741 the closed-loop gain-bandwidth product must also be 1 MHz.



The Open-loop response is shown in fig.
The Open-loop gain has a maximum value of 200,000. When the operating frequency increases to 5Hz, the Open-loop gain is down to 0.707 of its maximum value. the gain keeps Dropping off with increasing frequency. After the upper Cut-off frequency, f_{OL}, the gain to drops by 20 dB/decade.

The Unity-gain frequency is the frequency where the open-loop gain has decreased to Unity. In figure funity equals 1MHz.