EE3019 - Integrated Electronics Tutorial 11

1. **A Bode diagram depicting the magnitude loop gain, $|T(j\omega)|$, of a feedback amplifier is depicted in Figure 11.1.**

(a) **By inspection, write an expression for $|T(j\omega)|$ and for $\angle T(j\omega)$.**
(b) **Estimate the frequency where $|T(j\omega)|=1$ and determine the phase angle at this frequency.**
(c) **Determine the frequency where the $\angle T(j\omega) = -180°$.**

[(b) ~86.5 MHz, ~213°; (c) ~33 MHz]

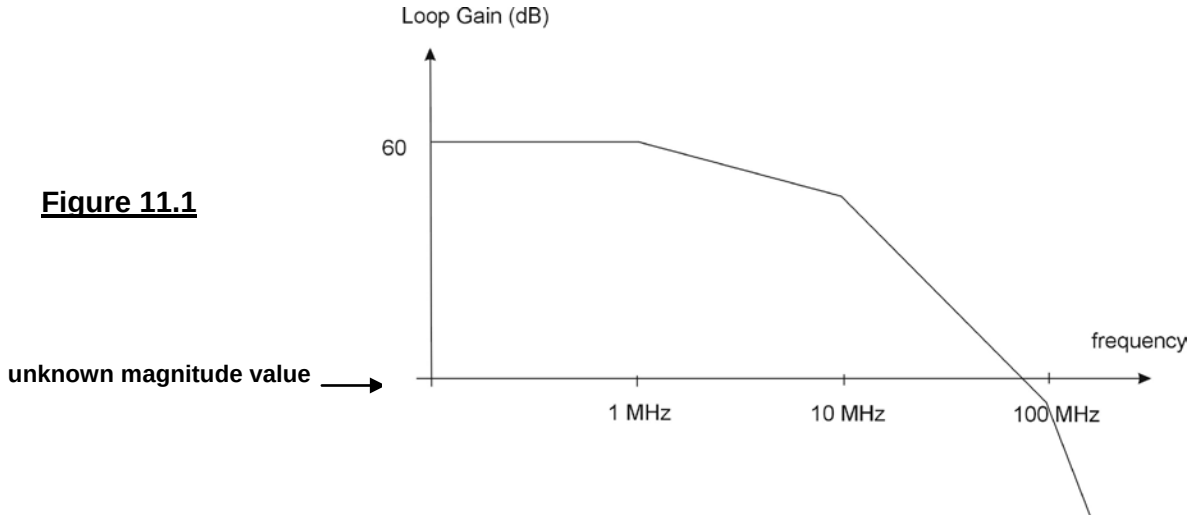

Figure 11.1

2. **The DC open loop of an op amp is 2 x 10^6 and the three dominant poles are 10 kHz, 1 MHz and 100 MHz. The op amp is used as a unity gain inverting amplifier with an input resistance of 100 kΩ. Draw the schematic of the amplifier and determine if the amplifier is stable.**

[unstable]

3. **(a)** **Draw the circuit schematic of an inverting amplifier with an ideal closed-loop gain of $-R_2/R_1$.**
(b) **Draw the feedback model of your design in part (a).**
(c) **Assuming that the open-loop gain of the op amp is given by**

$$a(j\omega) = \frac{a_0}{1+j(\omega/\omega_a)}$$ **, show that the closed loop response is**

$$A(j\omega) = \frac{A_0}{1+j(\omega/\omega_A)}$$ **where**

$$\left.\begin{aligned} A_0 &= \frac{b-1}{b}\,\frac{1}{1+\dfrac{1}{a_o b}} \\ \omega_A &= \omega_a(1+a_0 b) \end{aligned}\right\}$$ **where** $b = \dfrac{R_1}{R_1+R_2}$

(d) **Interpret your derivations in part(c).**