Problem 3 – (15 points)

Use the attached datasheet information. Amp1 is a CA3140 and Amp2 is an LM741.

(a) State each amplifiers frequency response transfer function \( (V_i/V_{in} \text{ and } V_o/V_i) \)

(b) State the overall transfer function \( (V_o/V_{in}) \)

(c) Write the equation to solve for the overall \( f_{3dB} \) of the circuit below. (Note you do not need to solve it)

\[\text{Amp 1 ⇒ } \frac{V_i}{V_{in}} = \frac{20}{(1+\frac{f}{20k})} \]

\( f_{3dB} = \frac{4\text{MHz}}{20} = 200k \) only for Amp1

\[\text{Amp 2 ⇒ } f_{3dB} = \frac{1M}{(30)} = 33.3k \]

\[\frac{V_o}{V_i} = \frac{-33.3k}{(1+\frac{f}{33.3k})} \]

\( \frac{V_o}{V_{in}} = \frac{-20}{(1+\frac{f}{200k}) \cdot \frac{30}{(1+\frac{f}{33.3k})}} = \frac{+600}{(1+\frac{f}{200k}) \cdot (1+\frac{f}{33.3k})} \)

\( 600\text{dB ⇒ } 20 \log(600) = 55.6\text{dB} \)

\( 55.6\text{dB} - 3\text{dB} = 52.6\text{dB} \)

\( 52.6\text{dB} = \frac{52.6}{10} = 426.6 \text{ V/V} \)

\[\text{c) } 426.6 = \frac{600}{\sqrt{1 + \left(\frac{200k}{f_{3dB}}\right)^2} \cdot \sqrt{1 + \left(\frac{33.3k}{f_{3dB}}\right)^2}} \]