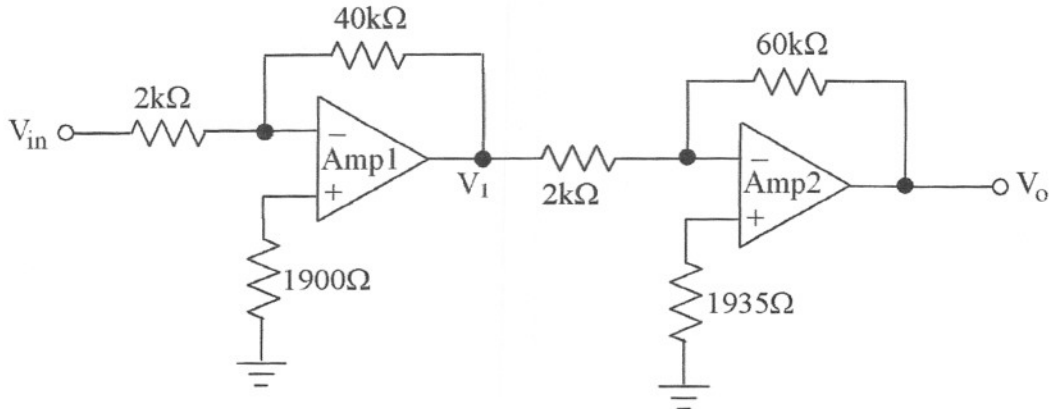


**Problem 3 – (15 points)**



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

- (a) State each amplifiers frequency response transfer function ( $V_1/V_{in}$  and  $V_o/V_1$ )
- (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}

a) Amp 1  $\Rightarrow \frac{V_1}{V_{in}} = \frac{20}{(1 + jf/200k)}$

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

Amp2  $\Rightarrow f_{3dB} = \frac{1M}{(30)} = 33.3k$

$\frac{V_o}{V_1} = \frac{-33.3k}{(1 + jf/33.3k)}$

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



$600dB \Rightarrow 20 \log(600) = 55.6dB$   
 $55.6dB - 3dB = 52.6dB$   
 $52.6dB = 10^{\frac{52.6}{20}} = 426.6 V/V$

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