EECE 2150 - Circuits and Signals: Biomedical Applications Fall 2022
Quiz 9

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Student Name: _____

In the figure, $R_1 = 2\,\mathrm{k}\Omega$ and $R_2 = 20\,\mathrm{k}\Omega$. We want to block power–line frequencies and we choose the cutoff frequency to be $f_c = 200\,\mathrm{Hz}$.

1. What type of filter is this?

☐ Low Pass ☐ High Pass ☐ Band Pass ☐ Band Stop

2. What is the value of the capacitor?

$C =$ _____ .

3. What is the magnitude of the gain in dB at $f = 60\,\mathrm{Hz}$?

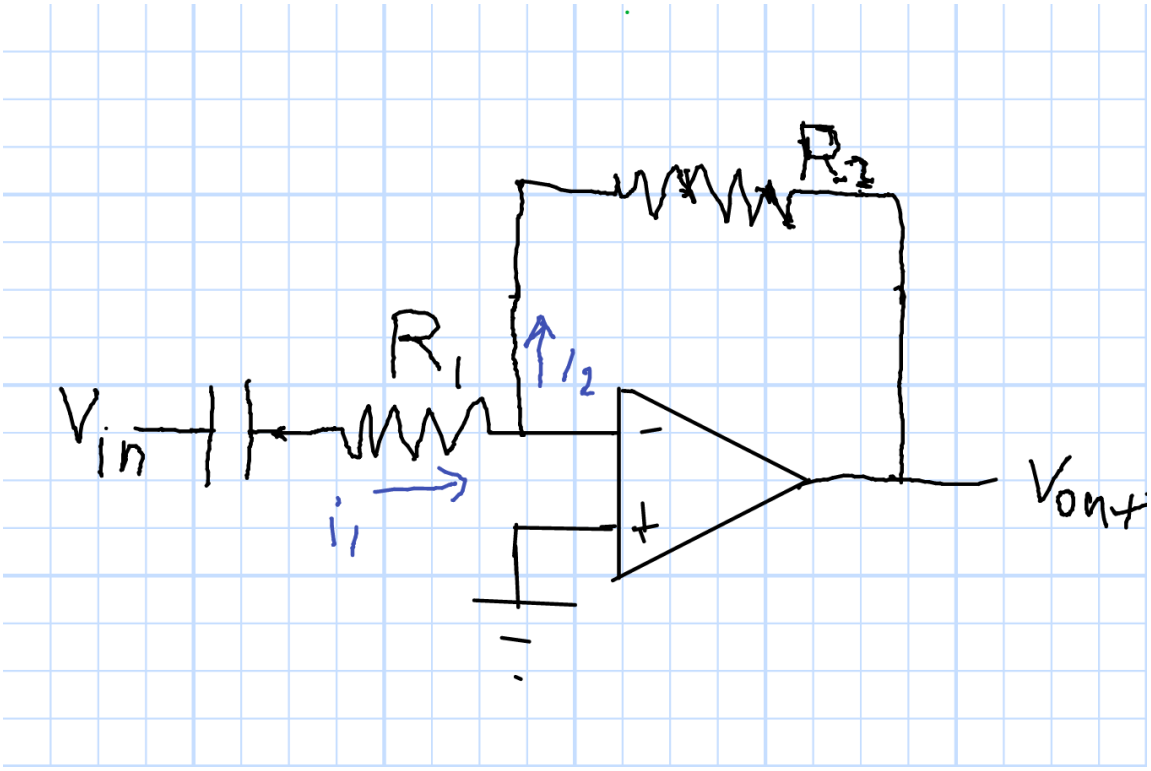
$H(60) =$ _____ .

4. What is the magnitude of the gain in dB at $f = 1\,\mathrm{kHz}$?

$H(1000) =$ _____ .

5. What is the magnitude of the gain in dB at very high frequencies?

$H(\infty) =$ _____ .


R_2
R_1
I_2
V_{in}
i_1
-
+
V_{out}

Solutions

1. What type of filter is this?

☐ Low Pass X High Pass ☐ Band Pass ☐ Band Stop

2. What is the value of the capacitor?

$\omega_c = 2\pi f_c$, $R_1 C = \tau = 1/\omega_c$, $C = 400\,\text{nF}$

3. What is the magnitude of the gain in dB at $f = 60\,\text{Hz}$?

$Z_1 = \frac{1}{j2\pi fC} + R_1$. $H(60) = 20\log_{10}|R_2/Z_1| = 9.2\,\text{dB}$

4. What is the magnitude of the gain in dB at $f = 1\,\text{kHz}$?

$H(1000) = 19.8\,\text{dB}$

5. What is the magnitude of the gain in dB at very high frequencies?

$H(\infty) = 20\log_{10}|R_2/R_1| = 20.02\,\text{dB}$