Name : _____ Section:_____ CWRU e-mail:_____

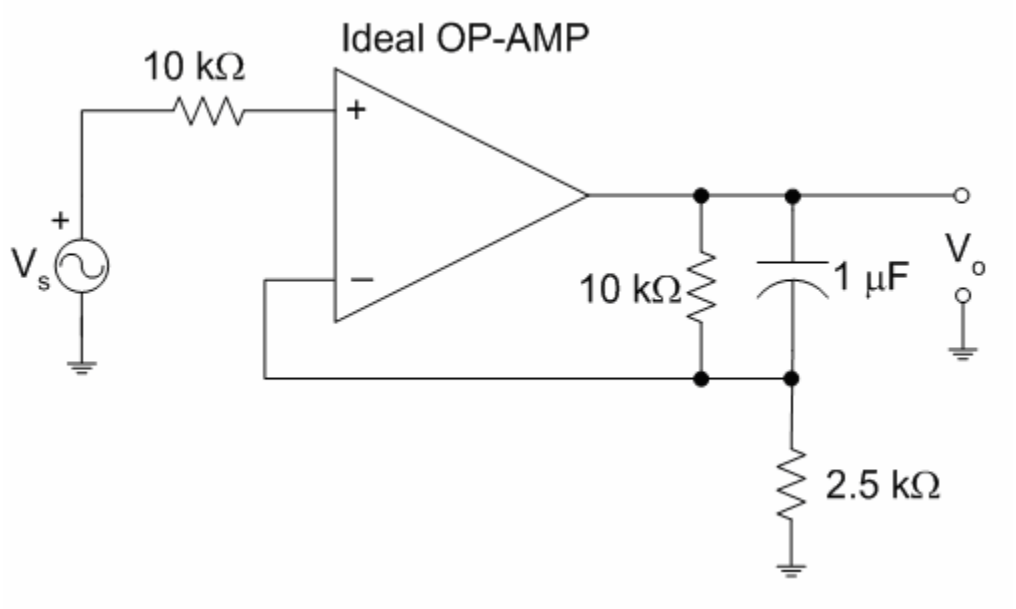
CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

Quiz No. 12 4/16/04

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE
BE SURE TO STATE ALL ASSUMPTIONS

Problem 1 Op Amp with Phasors (10 points)

Determine the transfer function $T(j\omega)=\frac{V_o(j\omega)}{V_s(j\omega)}$ of the following OP AMP circuit.



Think it is a subtractor with Z4=∞, Z2=10kΩ//1μF and V1=0V. So we can use the formula to calculate the gain.

$$T(j\omega)=(\frac{Z_1+Z_2}{Z_1})(\frac{Z_4}{Z_3+Z_4})=\frac{2.5k\Omega+(10k\Omega\,//\,\frac{1}{j\omega\cdot 1\mu F})}{2.5k\Omega}\cdot\frac{\infty}{10k\Omega+\infty}$$

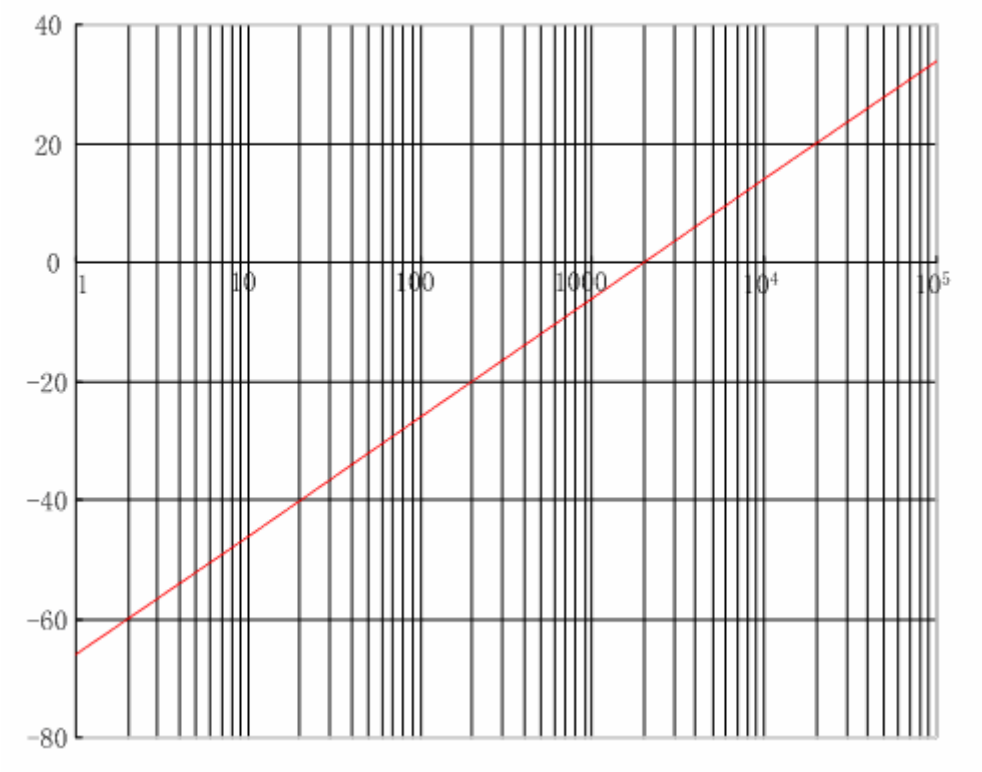
(10 points)

$$=\frac{2.5k\Omega+\frac{10k\Omega\cdot\frac{1}{1\mu Fj\omega}}{10k\Omega+\frac{1}{1\mu Fj\omega}}}{2.5k\Omega}=\frac{2.5k\Omega+\frac{10^4}{1+10^{-2}\,j\omega}}{2.5k\Omega}=\frac{5+j10^{-2}\omega}{1+j10^{-2}\omega}$$

Name : _____ Section:_____ CWRU e-mail:_____

Problem 2 Frequency dependent transfer functions (10 points)

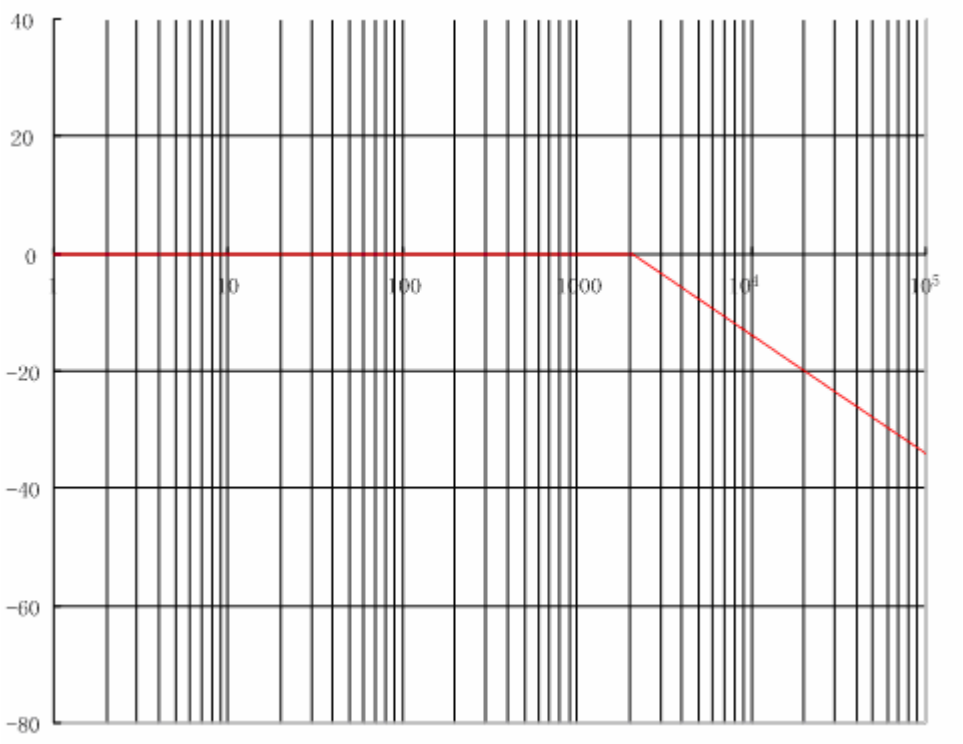
(a) Using the chart below plot the frequency dependence of $20\log_{10}|j\frac{\omega}{2000}|$.



(3 points)

(b) Using the chart below plot the frequency dependence of $-20\log_{10}|1+j\frac{\omega}{2000}|$.

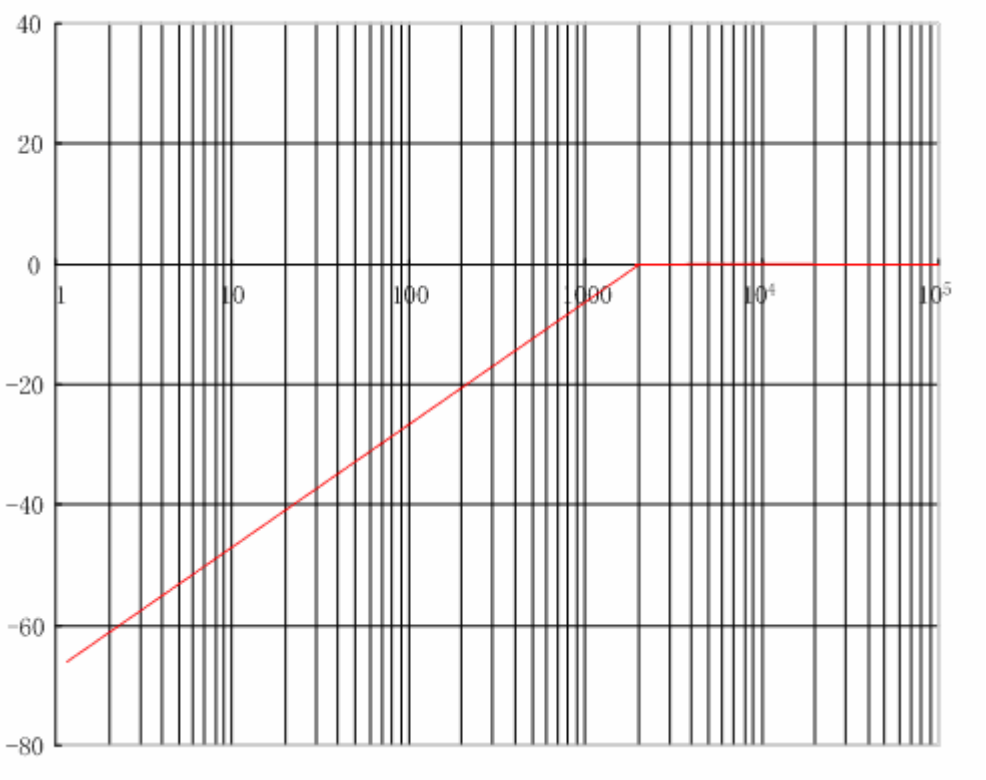
Name : _____ Section:_____ CWRU e-mail:_____



(3 points)

(c) If the expression of (a) and (b) are added together, what type of filter does this present? Sketch this frequency response on the plot below.

Name : _____ Section:_____ CWRU e-mail:_____



(3 points)

High pass filter (1 point)