Nanyang Technological University
School of Electrical & Electronic Engineering
EE2002 Analog Electronics

Tutorial 9

1. An amplifier has a transfer function:

$$T(s)=\frac{10^{12}s^2}{(s+10)(s+10^3)(s+10^6)}$$

Sketch the Bode magnitude plot for the gain response. Use the plot to estimate the values for the amplifier gain at 10^3 rad/s and 10^6 rad/s respectively. What should be the actual values of the gain at these frequencies? Determine the bandwidth of the response.

(Ans: 120 dB, 120 dB, 117 dB, 0.999x10^6 rad/s)

2. Using the following catalog of filters at your disposal:

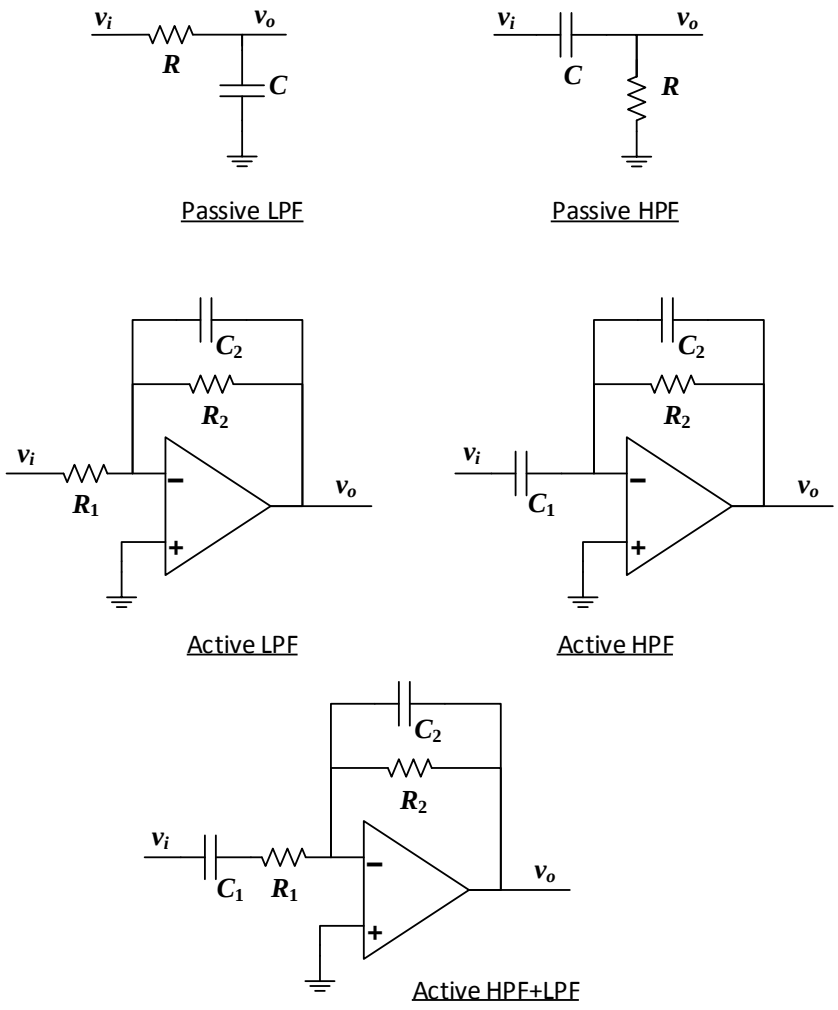
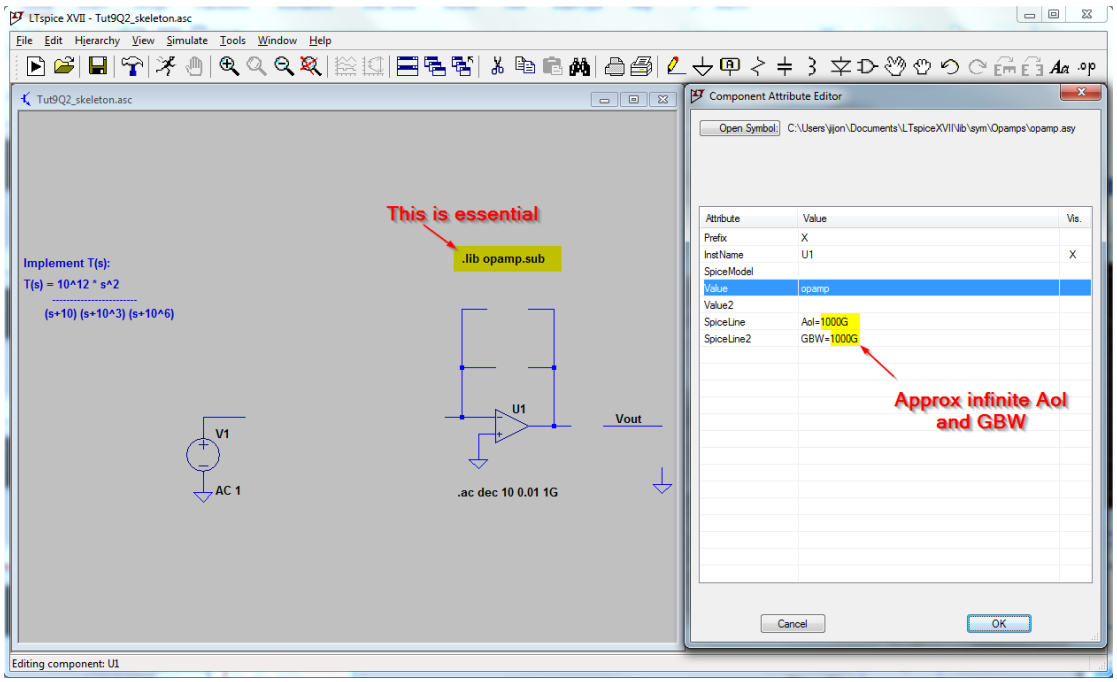


Figure 1

Design a filter cascade (e.g. Active HPF + Active LPF + Passive HPF) that will implement the transfer function *T(s)* in Question 1.

Use resistance values from 1Ω - 1GΩ, and capacitance values from 1pF – 1mF.

Run a .AC simulation in LTspice using an ideal Opamp (set Aol=GBW=1000G), to verify if the Bode plot matches with your answer to Question 1.



(Many correct answers)

In practice, why might a cascade of two (Active HPF + Active LPF) filters be preferred over a single (Active HPF+LPF) filter?

(Ans: a single Opamp in this case will require larger GBW product)