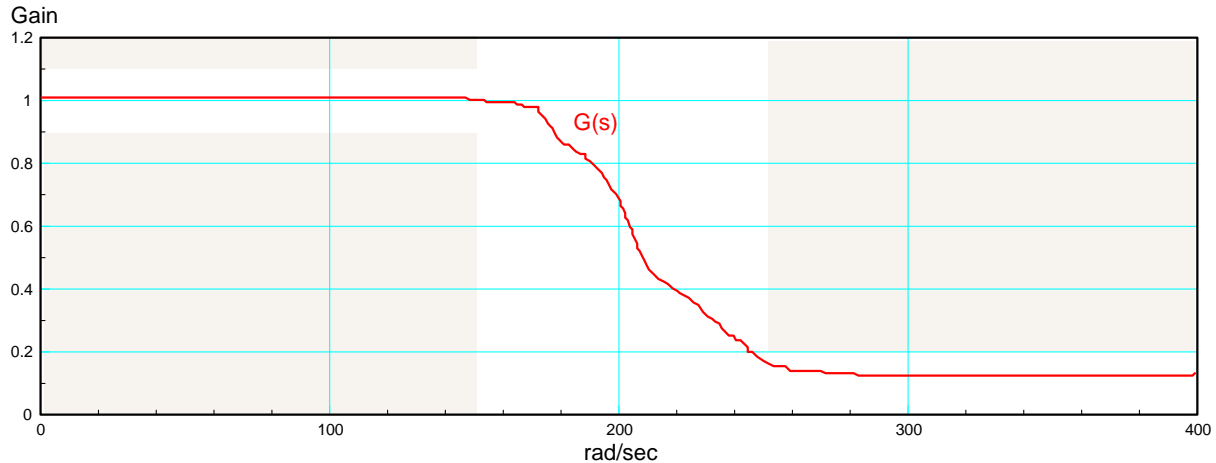# ECE 321 - Homework #4

Filters, Common Emitter Amplifiers. Due Monday, April 29th

Filters

1) (Option 1) Design a filter to meet the following requirements

(Option 2) Specify your own requirements (presumably to tie into your term project)

Input: -10V to +10V analog voltage, capable of 10mA, 0 - 1kHz

Output: -10V to +10V analog votlage, capable of 10mA

Relationship:

$$|G(s)| = \begin{cases} 0.9 < |G| < 1.1 & 0 < \omega < 150 \; \frac{\text{rad}}{\text{sec}} \\ |G| < 0.1 & \omega > 250 \; \frac{\text{rad}}{\text{sec}} \end{cases}$$

2) Design an op-amp circuit to implement the filter from problem #1

3) Using PartSim, determine the gain vs. frequency of your filter.
   - Does the simulation result match your calculations?

4) Build your circuit and verify it's operation (gain vs. frequency)

Transistor Amplifiers

5) Determine the Q-point (Vce, Ic) for the following transistor circuit. Assume
   - $\beta = 200$
   - $V_{be} = 0.7V$

6) Determine R1 and R2 so that the Q-point is
   - Vce = 6.0V

7) For your circuit of problem #6, determine the 2-port model for this transistor amplifier if set up as a Common Emitter amlifier

8) Determine the 2-port model for three cascaded amplifiers
   - Common Emitter - Common Emitter - Common Emitter

Problem 5 - 8