

### EE4445 Quiz 3

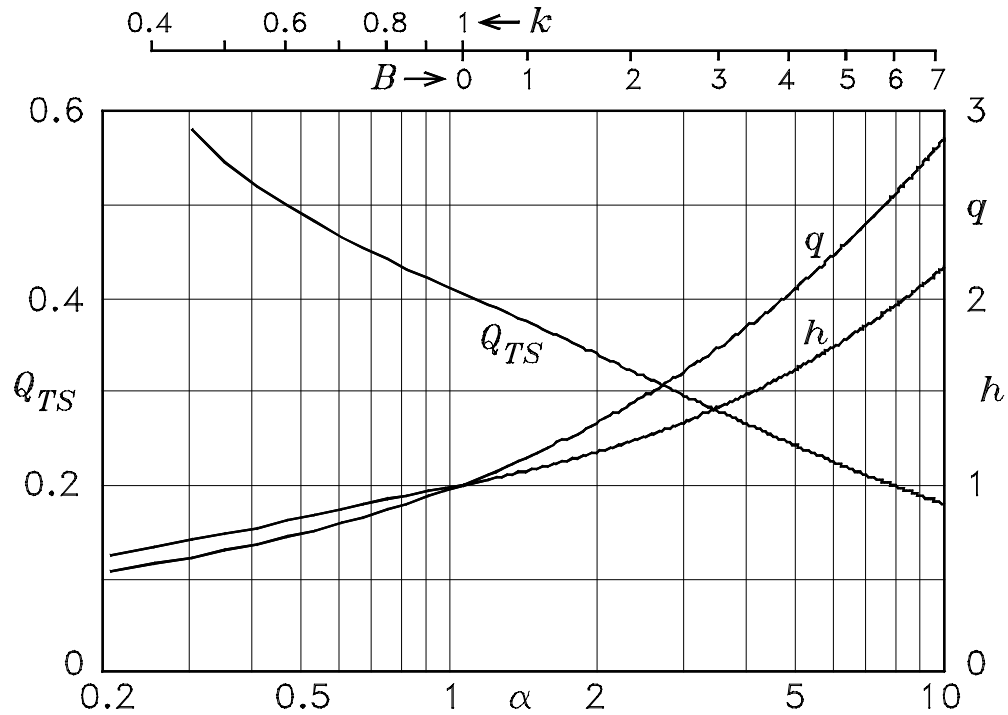
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Professor Leach

Name \_\_\_\_\_

**Instructions.** Print your name in the space above and at the top of all other pages in your quiz. Express all answers as a decimal number. Do not give an answer that involves fractions or symbols such as  $\pi$ . Draw a box around answers. Draw a horizontal line between problems. **Honor Code:** *I have neither given nor received help on this quiz.* Initials \_\_\_\_\_

1. (a) Sketch the Bode magnitude plot of the voice-coil impedance of a vented-box loudspeaker system that illustrates the impedance with the vent open and with the vent closed.  
 (b) Draw a diagram that illustrates a bridged amplifier. How does the output power of a bridged amplifier compare to that for an unbridged amplifier?  
 (c) Name 3 things that are affected by negative feedback in an amplifier.
  
2. A driver with a rated diameter of 8 in is to be designed for a vented-box system having the specifications:  $f_\ell = 40 \text{ Hz}$ ,  $V_{AB} = 1.2 \text{ ft}^3$ ,  $f_S = 20 \text{ Hz}$ , and  $R_E = 5 \Omega$ .  
 (a) Use the vented-box design chart and procedures to solve for  $V_{AS}$ ,  $Q_{ES}$ , and  $f_B$ . Assume  $M_{AC} \simeq M_{AS}$  and  $Q_{MS} = 6$ .  
 (b) What is the system alignment?  
 (c) What is the reference efficiency?



$Q_L = 7$  design chart.

3. (a) In a 3-way loudspeaker system, the woofer has a second-order low-pass filter crossover network. The crossover frequency is in the midband region of the woofer pressure response. Draw the phasor diagram for the pressure output of the woofer.
- (b) The woofer is to be crossed over to a closed-box midrange. The crossover frequency is to be above the midrange resonance frequency at the frequency where the phase of the midrange pressure response is  $45^\circ$ . A second-order crossover network is to be used on the midrange. Draw the phasor diagram for the pressure output of the midrange.
- (c) Should the midrange be connected in or out of electrical phase to the crossover network? For credit, you must explain how your answer follows from the phasor diagrams.
4. An amplifier is rated at an average sine-wave power  $P_{ave} = 60 \text{ W}$  into an  $8 \Omega$  load.
- (a) Solve for the rms and peak sine-wave output voltages.
- (b) Solve for the peak sine-wave output power.
- (c) For a square wave output having the same peak voltage as the sine wave, solve for the average and peak output powers.