

NAME:

Lab Section:

Lab Worksheet: Lab 4

Q1. Attach a printout of your Matlab script file that you wrote in E1 for computing and displaying $Z(2\pi f)$ versus f . Also attach a labeled graph of $Z(2\pi f)$ versus f for the air core inductor. What values of R and L did you obtain for the air core inductor. How did you check that these values are correct?

Q2. For each of parts (a), (b), (c), and (d) of E2 compare the measured values of the elements in the equivalent blockdiagrams to the known values of the elements. Explain any unusual differences. Attach labeled plots of $Z(2\pi f)$ versus f as necessary and show explicitly how you computed the element values from the measurements of $Z(2\pi f)$.

(a)

(b)

(c)

(d)

Q3. (a) What values did you obtain for R_e , L_e , R_{es} , L_{es} , and C_{es} in E3 for the speaker in free air? Attach labeled graphs of $Z(2\pi f)$ as necessary. Show in detail from what and how you calculated the values of the elements in the equivalent electrical circuit of the loudspeaker.

(b) For the speaker in the closed box, how did you expect that the mechanical resonance frequency changes? Explain your reasoning for this expected outcome. How does it compare to the actual outcome? Which of the element values in the equivalent electrical circuit is mostly responsible for the change in resonant frequency? Show your calculations.

(c) Repeat (b) for the speaker in free air with additional weight on the cone.

Q4. What differences did you observe between the frequency response measurements made with the 1" and the 2" pipe couplings between the two speakers? Attach labeled graphs as necessary. Try to explain where the differences come from and include your reasoning for the explanations. What is the (approximate) frequency range over which the magnitude of the frequency response of the speaker is within ± 6 dB?

Q5. What was the most important thing you learned in this lab?

Q6. What was the most interesting aspect of this lab?

Q7. How could this lab be improved?