

AET Physics 2010 "Practice" Test 3

1. (6 points) Sound at "normal" incidence is scattered with nearly perfect 180° diffusion from a single monocylindrical diffusor. So why doesn't everybody just make an entire wall to be one giant monocylinder? (Answer in terms of the diffusion properties, not so much the construction or aesthetic aspects...)
2. (6 points) In an example in the book, the absorption due to a Coca Cola bottle acting as a Helmholtz absorber was measured. It was found to have an absorption of 5.9 Sabins --- equivalent to a whole adult person --- at resonant frequency was 185 Hz, and its Q value was 276. Why was the coke bottle judged to not have a significant effect on the acoustics of the room?
3. (10 points) What assumptions are implied when we speak of a "reverberation time" for a room?
4. (6 points) What are two reasons why it is easier to measure reverb times at high frequencies than at low frequencies?
5. (6 points) You're noticing a problem with flutter echo in your pimped-out Wii-playing basement room. Your dad won't let you splay the walls (...something about building codes...), and you're already maxed-out on absorption from the shag carpet and your mom's Beanie Babie™ collection on the shelves. What else can you add to the room, in order to control the flutter without degrading the acoustical quality of the room?
6. (8 points) "Hey, Intern! Build me a bass trap to attenuate this 67Hz room mode! Then get me some coffee!" Explain how you would do this, including dimensions, materials used, and their placement.
7. (12 points) Your best bud says, "Hey hombre, we can use some of this egg-crate-foam stuff to make absorbers and outfit our studio!" Describe two different ways you could measure the absorption coefficient of the egg-crate-foam stuff.
8. (8 points) You've got some plywood with a surface density of 2 lb/ft^2 , and you want to make a "piece-o-wood" panel absorber to absorb frequencies around 130 Hz. How deep should you make the airspace?
9. (8 points) Stephen Doster has some pegboard with 5% perforation and thickness of 1" (from stacking 8 sheets of $1/8$ " pegboard). The hole diameter is 0.25". He wants to mount it near a wall to make a Helmholtz absorber with a resonant frequency of 96 Hz.. How deep should he make the air gap?
10. (8 points) Name 4 characteristics of a "perfectly diffuse sound field."
11. (6 points) You mount some porous absorber away from the wall with an air gap of 4". Name the three lowest frequencies at which absorption will be boosted the most due to this air gap.
12. (8 points) Sound is recorded in one room, and then played back in a room with a longer reverberation time. How does the reverberation time of the reproduced (i.e. "played-back") sound in the new room compare with the reverb times of the two rooms?
13. (8 points) Write a paragraph describing how would you measure the reverb time in Neely Dining Hall.
14. Extra Credit: (6 points) Write out the numerical sequence of well depths (i.e. their proportionality factors) for a quadratic residue diffusor based on the prime $p=11$.