

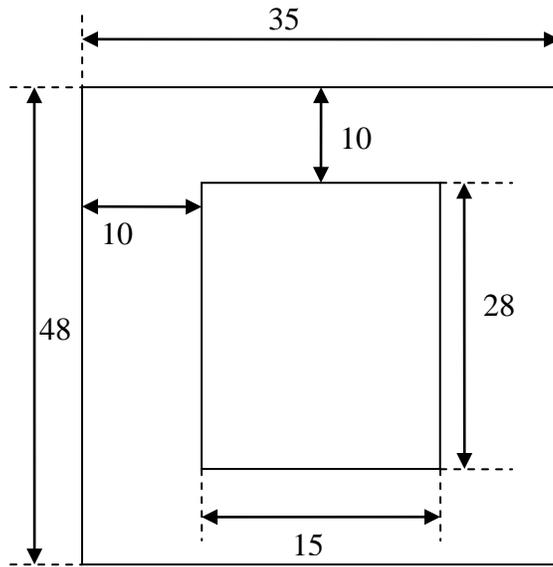
UNIVERSITY OF MIAMI
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ENGINEERING ACOUSTICS

Homework No.5

Submit solutions to the following exercises:

1. A wall impedance has value of $z_0 = 1236 + j412 \text{ Ns/m}^3$ at $f = 250 \text{ Hz}$.
 - a. Determine the corresponding absorption coefficient, β_0 .
 - b. Provide the equation of the circle in the complex impedance plane which provides the impedance values corresponding to $\beta = \beta_0$.
2. Generate a table with the 1/3-octave bands included in the 100 to 3150 Hz frequency range. Include their center-frequencies, low and high frequency edges and their bandwidths.
3. A 200 Hz plane wave is attenuated by 40 dB when travelling one meter within an air-saturated porous material. The structure factor of the material is $\chi = 1.5$ and the porosity $\sigma = 0.95$.
 - a. Estimate the specific flow resistivity, Ξ , in Ns/m^4 and in Rayl/cm.
 - b. Determine the folding frequency of this material, f_f .
 - c. Determine the sound speed propagation in this material, c_a , at the given frequency of 200 Hz. Is the medium dispersive or non-dispersive at this frequency?
 - d. Determine the characteristic impedance of this material at 500 Hz.
 - e. Determine the attenuation (in dB) through the material at a frequency twice the folding frequency.
4. A shoebox-shaped basketball arena has internal dimensions (LWH) of 48x35x8 meters as shown in the following floor plan. All interior surfaces are of painted concrete. The floor area within 10 meters from the walls contains metal seats (corridors and passages are ignored), leaving a court area of 28x15 m, which has wooden floor.
 - a. Calculate the average reverberation time of this space when unoccupied.
 - b. Find the reverberation radius of this space when unoccupied.
 - c. Calculate the average reverberation time of this space when fully occupied.
 - d. Find the reverberation radius of this space when occupied.
 - e. The basketball court is converted to a space for musical performance by upholstering all seats. The orchestra is located in a 5x15 m area in the middle of the court. Determine the new average reverberation time when the place is fully occupied.
 - f. Find the reverberation radius of this setup.



Date due: 11/04/2009