

UNIVERSITY OF MIAMI
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ENGINEERING ACOUSTICS

Homework No.4

Submit solutions to the following exercises:

1. An impedance tube needs to be designed to measure the material properties between 20 Hz and 4000 Hz under planar wave conditions.
 - a) If a cylindrical tube is to be used specify the radius of its cross-section and the length of the tube.
 - b) Is a tube with square cross-section is used specify the side of the square and the length of the tube

2. Some material sample is placed as the termination of an impedance tube. The first pressure maximum closest to the sample occurs at 170 mm from the sample. At that location the monitoring microphone reads 1 volt rms. At the first minimum closest to the sample the monitoring mic reads 0.7 volt rms.
 - a) Determine the reflection coefficient magnitude and angle for the material under test.
 - b) Determine the impedance and loss factor of the material under test.
 - c) Compute the complex amplitudes of the incident and reflected plane waves that exist in the tube.

3. Some material sample with normal specific acoustic impedance $z = 2 - 6j$ at 200 Hz is placed in an impedance tube. A calibrated monitoring mic reads the sound pressure level at 300 mm from the sample as $L_p = 96$ dB.
 - a) Determine the complex reflection coefficient of the material under test.
 - b) Determine the pressure rms value at that location.
 - c) Determine the location of the pressure maximum and minimum rms values closest to the sample and their locations.
 - d) Derive the expressions for the incident and reflected plane waves that exist in the tube.

Date due: 10/19/2009