AUBURN UNIVERSITY
SAMUEL GINN
COLLEGE OF ENGINEERING
AEROSPACE

AERO 4970/7970 Fundamentals of Aeroacoustics SET IV
Reflection, Spherical Waves, Simple Sources, etc.

1. Several noise sources produce the levels shown below when they operate alone:

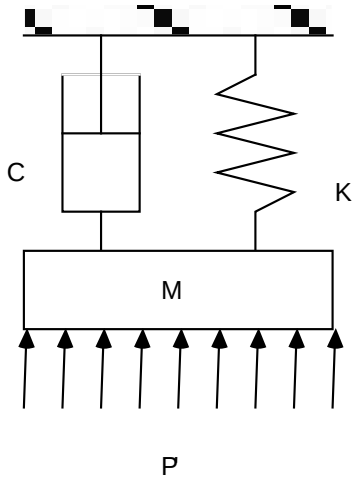
   Source A 55 dB
   Source B 60 dB
   Source C 75 dB

   a) Determine the combined levels of source A and B.
   b) Of B and C
   c) Of A, B and C.

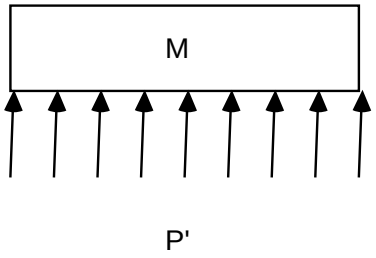
2. Determine the reflected wave resulting from an incident wave $p' = Ae^{i(\omega t - kx)}$ reflecting from a surface at $x = 0$ where the total fluctuation ($p'_{\text{total}} = p'_{\text{incident}} + p'_{\text{reflected}}$, the combination of the incident and reflected waves) must be zero.

3. Determine the reflected wave resulting from an incident wave $p' = Ae^{i(\omega t - kx)}$ reflecting from a surface at $x = 0$ where $p'_{\text{total}} / u'_{\text{total}} = Z$, the impedance of the surface. Compare your results to those in class when Z is infinite and to Problem 2 when $Z = 0$.

4. Determine the steady state motion of the spring, mass and damper system shown below as a result of the applied pressure $P' = P_A e^{i\omega t}$ on one side of the mass. Calculate the impedance, $Z = P'/u'$, of the system, where u' is the velocity of the mass. The area of the mass over which the pressure is applied is A. Hint: Consult a dynamics or vibrations textbook.



5. Determine the steady state motion of the mass shown below as a result of the applied pressure $P' = P_A e^{i\omega t}$ on one side of the mass. Calculate the impedance, $Z = P'/u'$, of the system, where u' is the velocity of the mass. The area of the mass over which the pressure is applied is A. Ignore gravity.



6. Compare the solutions to Problems 4 and 5. When is the solution to Problem 5 a good approximation to the solution of Problem 4?