Noise Engineering & Aeroacoustics **Class 2017_Fall**
Prof. Soogab Lee **(TA : Chanil Chun)**

HomeWork #1 (Due 09/25)

PART I: Warming-up

1. What is the speed of sound in air/in water? Explain why. (5pts)

2. Write down the approximate sound level of human shouting/threshold of pain. (5pts)

3. Write down the audible frequency range of human, and describe the relationship between frequency band and hearing sensitivity. (5pts)

4. Which sentence is incorrect? (5pts)

1) 1 octave is equal to a double frequency.
2) Audible frequency range is about 10 octaves.
3) 1 octave is 1200 cents.
4) Octave is a linear unit.

5. What can be inferred if dB(A) and dB(C) of a certain music showed similar values? (5pts)

1) The music mostly contains high pitch instrument.
2) The music mostly contains low pitch instrument.
3) The music has a flat frequency characteristic.
4) Not related to frequency characteristics.

PART II. Basic Problems

1. Jot down technical issues on noise problems you have met in your life. Then, explain what kinds of technology can be applied to these problems? (10pts)

2. Explain the following noise level indices, and their meaning (25pts)

(Example) SPL: Sound Pressure Level (dB)

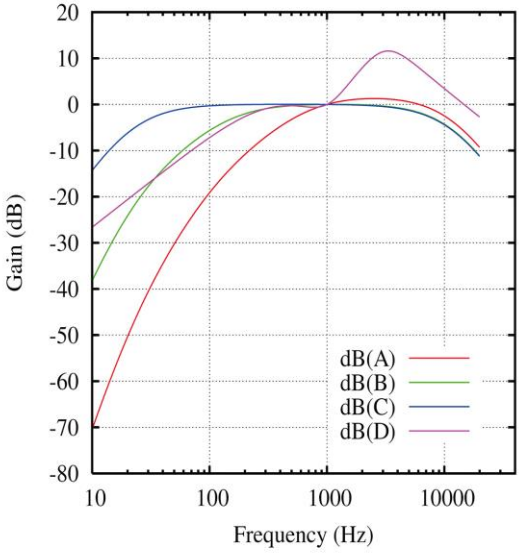
$$SPL(dB) = 20\log_{10}\left[\frac{p`_{rms}}{2\times10^{-5}(N/m^2)}\right]$$

1) PWL
2) L_{eq}
3) SEL
4) L_{DEN}
5) WECPNL

3. Speaker 1/speaker 2 can radiate 100Hz and 1kHz pure tone sound respectively.

a) At a specific position, SPL measured by speaker 1 and speaker 2 are 80dB / 70dB respectively. What would be the SPL at this place when both speakers are turned on? (10pts)

b) Calculate the answer of a) in dB(A) using following weighting curve. (10pts)



4. "When an orchestra plays a violin concerto, if there are 10 performers in a violin part, their sound would be 10 times louder than that of Solo violinist. So, in order to mediate the sound, volume of solo instrument should be amplified 10 times..."

a) Refute above statement, using concept of sound level and loudness. (10pts)
b) Assuming all violinists play 1kHz pure tone only, find the number of players needed to radiate 'two times' louder than Solo performer using the following Loudness-SPL curve. (Assume that phases of each sound are all different.) (10pts)