MCL 314: Acoustics and noise control

Minor II (July-Nov 2017)

Time: One hour | Max. Marks: 40

Q1. A plane harmonic acoustic wave propagating in water is incident normally on the water-air boundary.

a) Derive expressions for reflection and transmission coefficients for acoustic pressure, acoustic velocity and acoustic power.

b) Calculate these coefficients if density and speed of sound in air and water are: (1.01 kg/m^3, 343 m/sec) and (1000 kg/m^3, 1450m/sec) respectively. Justify physically the calculated values.

(10)

Q2. a) A sound source radiates 5 watts of acoustic power at a frequency of 40 Hz in a free field. Assuming it behaving like a point source, determine the average intensity and sound pressure level (dB) at a point 13 m away from the source. Also find acoustic particle velocity.

b) If the source in a) is placed near the edge between the roof and a vertical wall, then how much would be the power radiated and how much would be the average intensity and the SPL at a point 13 m away. (6)

Q3. a) Can a practical source of sound, say an electric motor in operation, be approximated as a point monopole source? If yes, then under what conditions and if not then why not?

b) What do you mean by acoustic near field and acoustic far-filed of a source? (6)

Q4. What is coincidence effect? What is critical frequency? (6)

Q5. Using mass law find the transmission loss over 1/1 octave band center frequencies (between 125 Hz and 4 kHz) of a 1.6 mm steel sheet having a density of 7800 Kg/m3. (6)

Q6. Briefly describe how baffled and un-baffled oscillating pistons act as sound sources? What is the notable difference between the sound radiations in the two cases? (6)