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Courses » Fundamentals of Acoustics

Announcements

Course

Forum

Progress

Mentor

Unit 5 - Week 04: Transmission line equations

Course outline

How to access the portal?

Week 01: Introduction and Terminology

Week 02: Concept Review

Week 03: Wave equation

Week 04: Transmission line equations

- Lesson 1: Waveguide
- Lesson 2: Transmission Line Equations -Part I
- Lesson 3: Transmission Line Equations - Part II
- Lesson 4: Transmission Line Equations - Part III
- Lesson 5: Transmission Line Equations - Part IV
- Lesson 6: Transmission Line Equations - Part V
- Quiz : Week 4: Assignment
- Week 4: Assignment Solution

Week 05: 1-D Waves

Week 06: Power and spherical waves

Week 07: Spherical waves and interference

Week 4: Assignment

The due date for submitting this assignment has passed.

Due on 2017-02-21, 23:59 IST.

Submitted assignment (Submitted on 2017-02-12, 20:27)

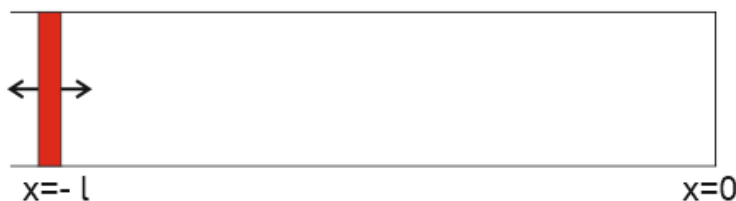
1) Transmission Line equation for pressure is $p(x, t) = \text{Re}[P(x, s)e^{st}]$. In general, $P(x, s)$ is: **1 point**

- $P(x, s) = [P_+(s) - P_-(s)]e^{\frac{sx}{c}}$
- $P(x, s) = [P_+(s) + P_-(s)]e^{\frac{sx}{c}}$
- $P(x, s) = P_+(s)e^{-\frac{sx}{c}} - P_-(s)e^{\frac{sx}{c}}$
- $P(x, s) = P_+(s)e^{-\frac{sx}{c}} + P_-(s)e^{\frac{sx}{c}}$

2) What is true regarding characteristic impedance (Z_0) ? **1 point**

- It depends on frequency of sound wave through the media.
- It is a complex quantity.
- It does not depend on boundary conditions.
- It depends on position.

3) Consider a closed tube with a reciprocating piston at one end as shown in figure. **1 point**



Velocity envelope of a velocity standing wave formed inside the tube is:

- $\frac{P_1}{Z_0 \cos \frac{\omega l}{c}} \left| \sin \frac{\omega x}{c} \right|$
- $\frac{P_1}{Z_0 \sin \frac{\omega l}{c}} \left| \sin \frac{\omega x}{c} \right|$
- $\frac{P_1}{Z_0 \cos \frac{\omega l}{c}} \left| \cos \frac{\omega x}{c} \right|$
- $\frac{P_1}{Z_0} \left| \sin \frac{\omega x}{c} \right|$

4) Consider an open tube having a reciprocating piston (sound source) at one end. The other end is open to atmosphere. During sound propagation inside the tube a standing wave for pressure will be generated as shown in the figure. Calculate the length D. **1 point**

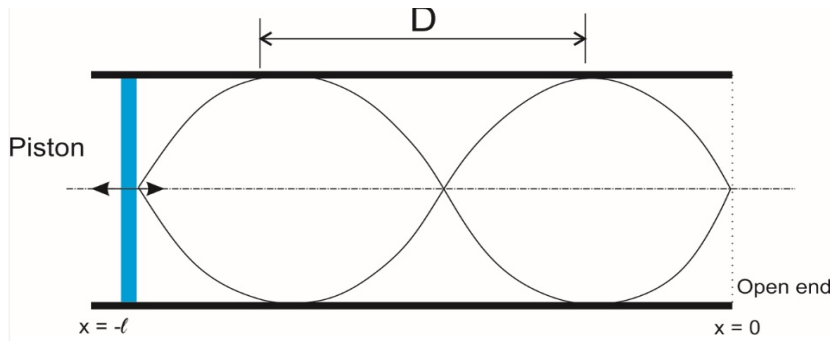
Week 08: Directivity and mufflers

Week 09: Sound in rooms

Week 10: Reverb time and FFT

Week 11: Weighting and loudness

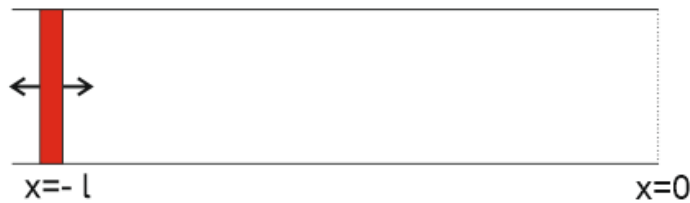
Week 12: Miscellaneous topics and closure



- λ
- $\lambda/4$
- $\lambda/2$
- $\lambda/8$

5) Consider an open tube with a reciprocating piston at one end as shown in figure.

1 point



A pressure and velocity standing wave is formed inside the tube when sound propagates through the tube. In this scenario, choose the correct statement given in following options.

- At $x=0$, pressure is zero and velocity is at its maximum.
- At $x=-l$, pressure is zero and velocity is at its maximum.
- At $x=0$, pressure is maximum and velocity is at its maximum.
- At $x=-l$, pressure is maximum and velocity is at its maximum.

6) Choose the correct statement from the following options.

1 point

- I. Amplitude of a travelling wave varies with position.
- II. Amplitude of a standing wave varies with position.
- III. Amplitude of a travelling wave is a constant.

- I and II
- I and III
- II and III
- III

7)

1 point

Specific acoustic impedance (Z_L) is defined as: ($U(x, \omega)$ - Complex Velocity and $P(x, \omega)$ - Complex Pressure)

- $\frac{U(x, \omega)}{P(x, \omega)}$
- $\frac{P(x, \omega)}{U(x, \omega)}$
- $\frac{Re[U(x, \omega)]}{Re[P(x, \omega)]}$
- $\frac{Re[P(x, \omega)]}{Re[U(x, \omega)]}$

8)


1 point

One of the solutions of a 1D wave equation is $u(x, t) = F(x - ct) + G(x + ct)$. Here, function G represents

- Forward travelling wave.
- Reflected wave.
- Standing wave.
- None of the above.

Previous Page

End

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