Course outline

Assignment_4

The due date for submitting this assignment has passed.

Due on 2021-02-17, 23:59 IST.

As per our records you have not submitted this assignment.

1) Insertion loss (IL) of a muffler is defined as the difference between the *1 point*

- acoustic power radiated without the muffler, and with the muffler, and depends on the source characteristics
- acoustic power radiated without the muffler, and with the muffler, but does not depend on the source characteristics
- acoustic power incident on the muffler proper and that transmitted downstream into an anechoic termination, and does not depend on source characteristics
- sound pressure levels at two arbitrarily selected points in the exhaust and tail pipe of the muffler

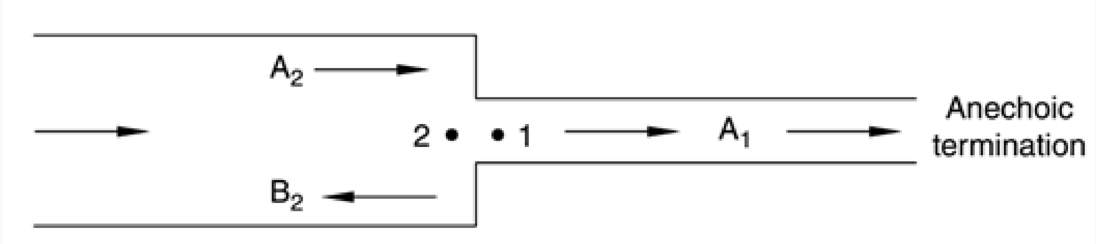
No, the answer is incorrect.
Score: 0
Accepted Answers:
acoustic power radiated without the muffler, and with the muffler, and depends on the source characteristics

2) The peak in the Transmission Loss (TL) spectrum of a side-branch resonator occurs at resonance frequencies given by *1 point*

- $f_n = (2n+1)\frac{c_0}{4L}$
- $f_n = \frac{nc_0}{4L}$
- $f_n = \frac{nc_0}{2L}$
- $f_n = (2n+1)\frac{c_0}{2L}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$f_n = (2n+1)\frac{c_0}{4L}$

3) Consider a simple-area discontinuity, i.e., sudden-area contraction shown below *1 point*



For diameter-ratio given by $\frac{D_2}{D_1} = 5$, the TL is given by

- 8.3 dB
- 2.4 dB
- 0 dB
- 10 dB

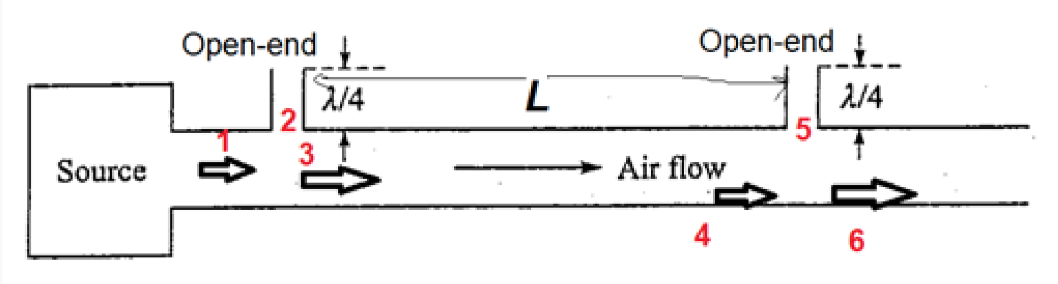
No, the answer is incorrect.
Score: 0
Accepted Answers:
8.3 dB

4) Assuming only planar wave propagation, what can be said about the acoustic variables across the sudden-area discontinuity *1 point*

- pressure and axial particle velocity is continuous, and additionally the axial particle velocity is zero at the annular plates
- only the pressure is continuous
- pressure and mass velocity is continuous
- depends on the area-ratio

No, the answer is incorrect.
Score: 0
Accepted Answers:
pressure and axial particle velocity is continuous, and additionally the axial particle velocity is zero at the annular plates

5) The relation between the upstream variable 1 and downstream variable 6 of the following acoustic filter is represented by following [T] matrix representation *1 point*



- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \tan k_0 L} & 1 \end{bmatrix} \begin{bmatrix} \cos k_0 L & jY_c \sin k_0 L \\ \frac{j}{Y_c}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \tan k_0 L} & 1 \end{bmatrix} \begin{Bmatrix} p_6 \\ v_6 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \cot k_0 L} & 1 \end{bmatrix} \begin{bmatrix} \cos k_0 L & jY_c \sin k_0 L \\ \frac{j}{Y_c}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \cot k_0 L} & 1 \end{bmatrix} \begin{Bmatrix} p_6 \\ v_6 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \cot k_0 L} & 1 \end{bmatrix} \begin{bmatrix} \cos k_0 L & jY_c \sin k_0 L \\ \frac{j}{Y_c}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{Bmatrix} p_6 \\ v_6 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} \cos k_0 L & jY_c \sin k_0 L \\ \frac{j}{Y_c}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{Bmatrix} p_6 \\ v_6 \end{Bmatrix}$$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \tan k_0 L} & 1 \end{bmatrix} \begin{bmatrix} \cos k_0 L & jY_c \sin k_0 L \\ \frac{j}{Y_c}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_t \tan k_0 L} & 1 \end{bmatrix} \begin{Bmatrix} p_6 \\ v_6 \end{Bmatrix}$$

6) Consider a simple concentric expansion chamber muffler with the following geometrical parameters: chamber diameter and length given by $D_0 = 100\text{mm},\ L = 300\text{mm}$, port diameter $d_0 = 40\text{mm}$ What is the maximum transmission loss (TL)? *1 point*

- 10.1 dB
- 4 dB
- 15.9 dB
- 25 dB

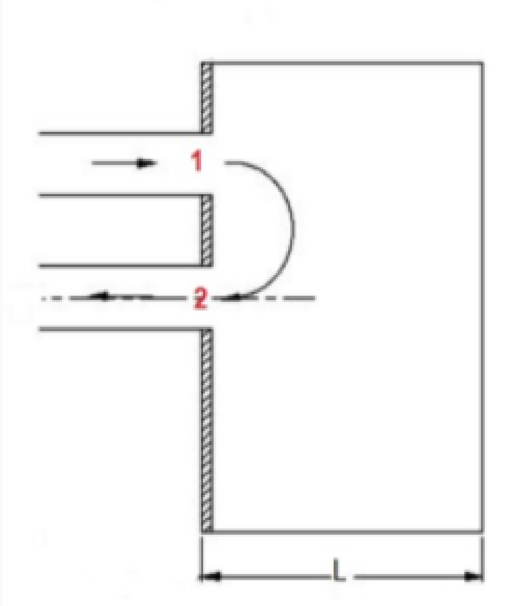
No, the answer is incorrect.
Score: 0
Accepted Answers:
10.1 dB

7) In the same problem, the frequency (Hz) of occurrence of the first attenuation dome is given by (Take sound speed c0 = 343 m/s) *1 point*

- 286 Hz
- 572 Hz
- 858 Hz
- 150 Hz

No, the answer is incorrect.
Score: 0
Accepted Answers:
286 Hz

8) Consider the flow-reversal configuration with length L much larger than the diameter D as shown below. *1 point*



The [T] matrix representation between the upstream state-variables 1 and downstream state-variables 2 is given by the following matrix representation:

- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_{chamber} \cot k_0 L} & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} \cos k_0 L & jY_{chamber} \sin k_0 L \\ \frac{j}{Y_{chamber}}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} \cos k_0 L & -jY_{chamber} \sin k_0 L \\ \frac{-j}{Y_{chamber}}\sin k_0 L & \cos k_0 L \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$$
- $$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ -jY_{chamber} \cot k_0 L & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ \frac{1}{-jY_{chamber} \cot k_0 L} & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$$

9) For the above muffler configuration, the transmission loss (TL) spectrum is characterized by *1 point*

- peaks and troughs
- domes and troughs
- flat (constant) TL spectrum
- cannot say

No, the answer is incorrect.
Score: 0
Accepted Answers:
peaks and troughs