Assignment_5

The due date for submitting this assignment has passed.

Due on 2021-02-24, 23:59 IST.

As per our records you have not submitted this assignment.

1) The maximum transmission loss (TL) for a simple concentric expansion chamber of length L, and a large area expansion ratio m is given by *1 point*

- $\approx 20\log_{10}(\frac{m}{2})$
- $\approx 20\log_{10}(\frac{1}{2m})$
- $\approx 20\log_{10}(m)$
- $\approx 10\log_{10}(\frac{m}{2})$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\approx 20\log_{10}(\frac{m}{2})$

2) Consider an extended-inlet and extended-outlet muffler configuration of chamber length L = 500 mm, chamber and port diameters equal to 250 mm and 50 mm, respectively. Assume a planar wave propagation throughout the muffler chamber, the *theoretical* tuned extension lengths at the inlet and outlet is given by *1 point*

- $l_1 = 0.5L = 250mm, l_2 = 0.25L = 125mm$
- $l_1 = 0.25L = 125mm, l_2 = 0.50L = 250mm$
- $l_1 = 0.25L = 125mm, l_2 = 0.25L = 125mm$
- $l_1 = 0.5L = 250mm, l_2 = 0$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$l_1 = 0.5L = 250mm, l_2 = 0.25L = 125mm$
$l_1 = 0.25L = 125mm, l_2 = 0.50L = 250mm$

3) In the above problem, higher-order modes are generated at the neck extensions. As a result the actual tuned lengths are different from the theoretical predictions. An empirical expression for end-correction δ_a at the inlet and outlet (including wall-thickness of the extended pipes) is given by *1 point*

$$\frac{\delta_a}{d} = a_0 + a_1(\frac{D}{d}) + a_2(\frac{t_w}{d}) + a_3(\frac{D}{d})^2 + a_4(\frac{D}{d}\frac{t_w}{d}) + a_5(\frac{t_w}{d})^2$$

where $a_0 = 0.005177, a_1 = 0.0909, a_2 = 0.537, a_3 = -0.008594, a_4 = 0.02616, a_5 = -5.425$

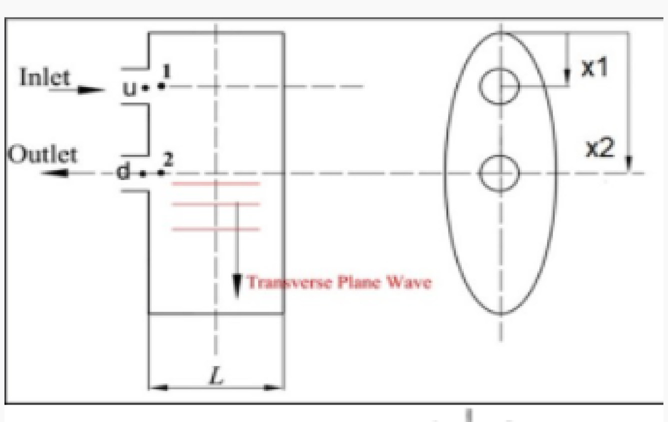
Assume the wall-thickness $t_w = 3mm$. The tuned geometric lengths of the extensions at the inlet and outlet are given by

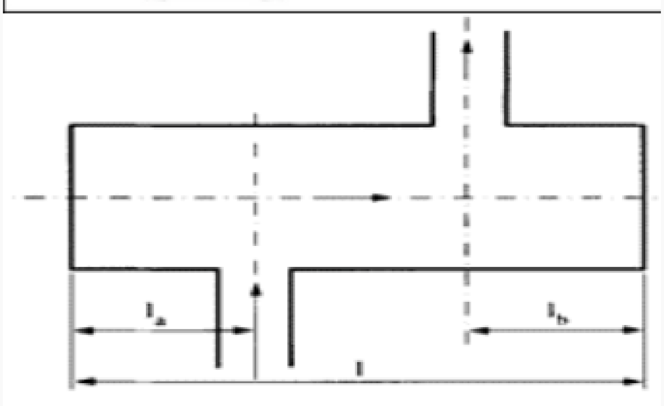
- $l_1 = 236.73mm, l_2 = 111.73mm$
- $l_1 = 263.27mm, l_2 = 138.27mm$
- $l_1 = 263.27mm, l_2 = 111.73mm$
- $l_1 = 238mm, l_2 = 113mm$

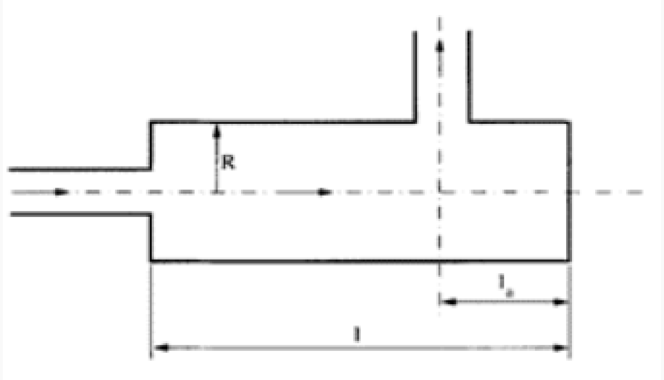
No, the answer is incorrect.
Score: 0

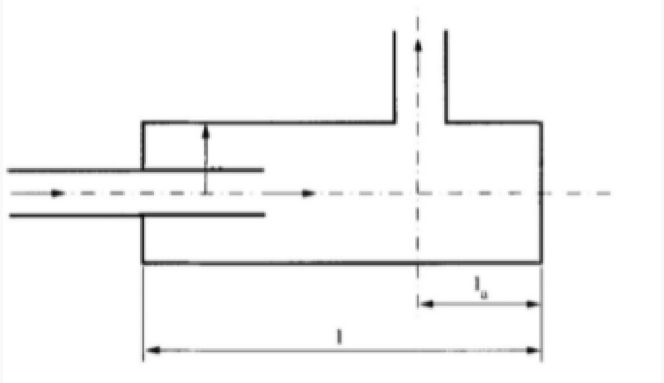
Accepted Answers:
$l_1 = 236.73mm, l_2 = 111.73mm$

4) Which of the following configuration(s) shown below is acoustically equivalent to the extended-inlet and extended-outlet chamber muffler. *1 point*



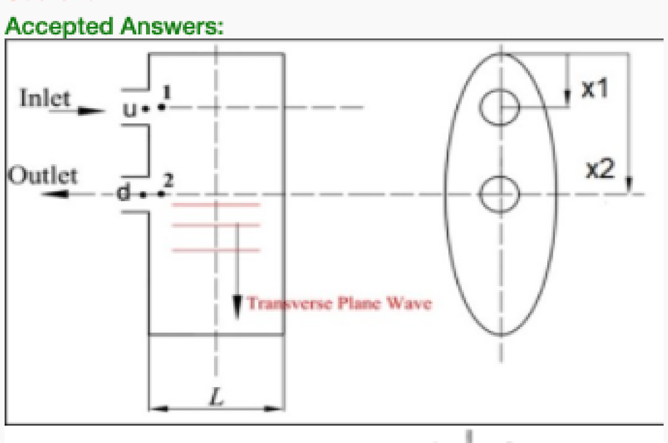


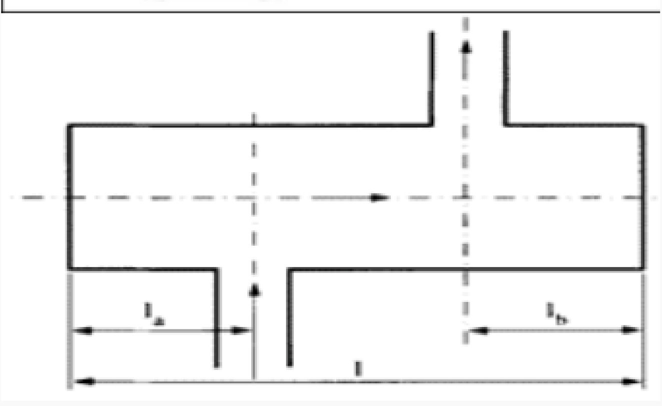




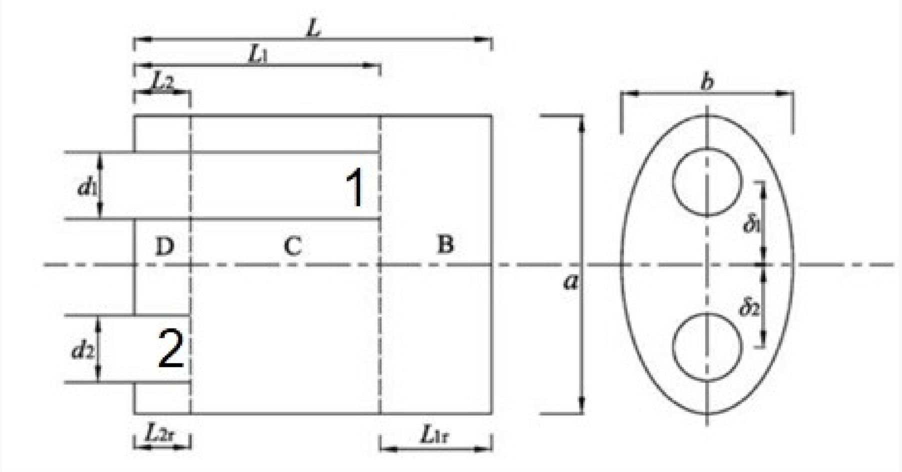
No, the answer is incorrect.
Score: 0

Accepted Answers:





5) Consider the flow-reversal end-chamber configuration with extension inside the chamber. Assuming axial plane wave propagation, the transfer [T] matrix between the points at the inlet duct 1 (longer pipe) and outlet duct 2 (shorter pipe) is given by *1 point*



- $\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ 1/Z_B & 1 \end{bmatrix} [\mathbf{T_C}] \begin{bmatrix} 1 & 0 \\ 1/Z_D & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$
- $\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = [\mathbf{T_C}] \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$
- $\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ 1/Z_D & 1 \end{bmatrix} [\mathbf{T_C}] \begin{bmatrix} 1 & 0 \\ 1/Z_B & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$
- None of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{Bmatrix} p_1 \\ v_1 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ 1/Z_B & 1 \end{bmatrix} [\mathbf{T_C}] \begin{bmatrix} 1 & 0 \\ 1/Z_D & 1 \end{bmatrix} \begin{Bmatrix} p_2 \\ v_2 \end{Bmatrix}$

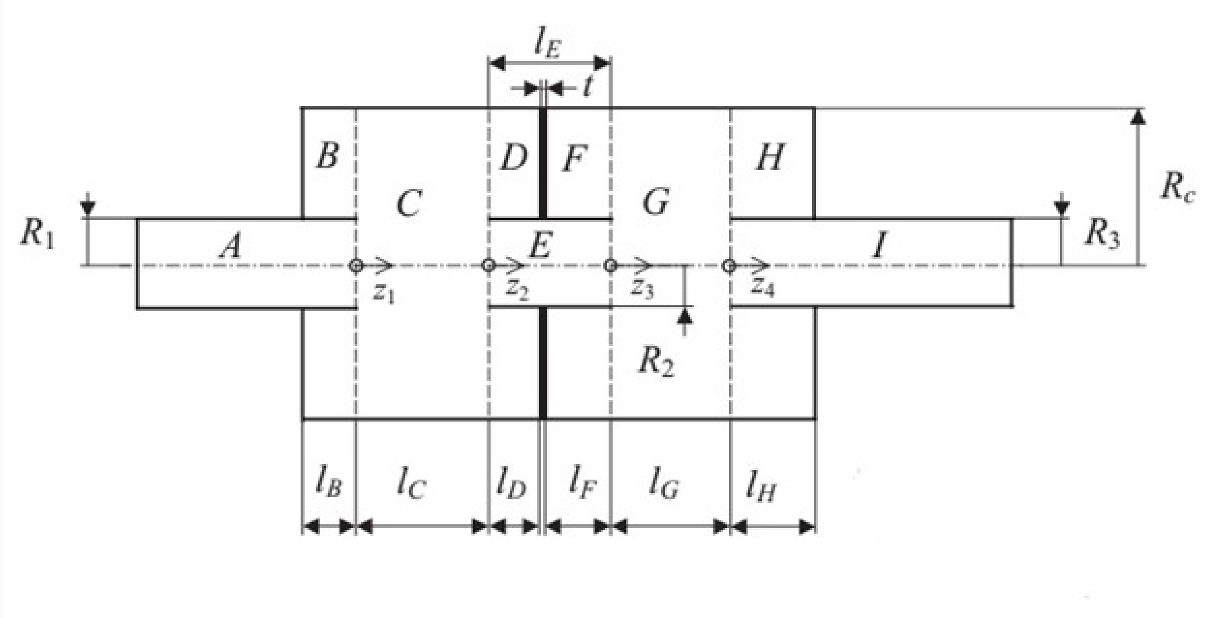
6) Consider a circular cylindrical muffler chamber with length $L = 600$ mm and side-inlet and side-outlet ports. Where should the side-inlet and side-outlet ports $w.r.t$ one of the end faces be located to obtain a broadband attenuation performance? *1 point*

- $l_1 = 0.5L, l_2 = 0.75L$
- $l_1 = 0.25L, l_2 = 0.50L$
- $l_1 = 0.25L, l_2 = 0.75L$
- $l_1 = 0.3, l_2 = 0.7L$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$l_1 = 0.5L, l_2 = 0.75L$
$l_1 = 0.25L, l_2 = 0.50L$

7) Consider the dual chamber configuration with neck extensions shown below. Assuming plane wave propagation and typical geometrical dimensions used, find the TL graph in MATLAB. On the basis of your study, what essential behaviour/feature do you observe at very low frequency? *1 point*



- an attenuation dome followed by a trough
- attenuation peak
- increasing graph
- very low-frequency behavior depends on the extension lengths

No, the answer is incorrect.
Score: 0

Accepted Answers:
an attenuation dome followed by a trough