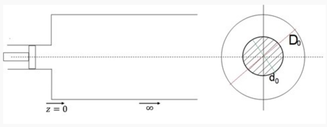
Assignment_11

The due date for submitting this assignment has passed.

Due on 2021-04-07, 23:59 IST.

As per our records you have not submitted this assignment.

1) Consider a semi-infinite circular waveguide of diameter $D_0 = 200mm$ with a port of diameter d = 40 mm located *concentrically* on the end face as shown below. For excitation frequency $f_0 = 2150Hz$, which modes (other than the plane wave or (0,0) mode) will be excited and propagate? **1 point**



Take sound speed c0 = 343.14 m/s

- (1,0) circumferential and (0,1) radial modes
- only the (0,1) radial mode
- (1,0) and (2,0) circumferential modes and (0,1) radial mode
- none of the higher-order modes will be excited

No, the answer is incorrect.
Score: 0

Accepted Answers:
only the (0,1) radial mode

2) Now consider a semi-infinite circular waveguide having same dimensions as considered in Q.1 but the port is *offset* at a distance $\delta = 0.6276R_0 = 62.76mm$ along a diameter. For the same excitation frequency $f_0 = 2500Hz$ and sound speed considered in Q.1, which modes will now be excited and propagate? **1 point**

- both (1,0) circumferential and (0,1) radial modes
- only the (0,1) radial mode
- (1,0) and (2,0) circumferential modes
- only (1,0) circumferential mode

No, the answer is incorrect.
Score: 0

Accepted Answers:
(1,0) and (2,0) circumferential modes

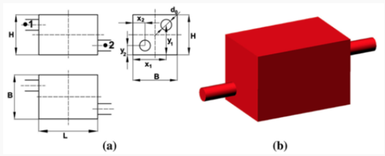
3) Consideration of the higher-order modes to compute acoustic attenuation performance of a muffler requires the port-chamber interface or the discontinuity to be appropriately modelled. The least accurate to the most accurate modelling is represented by the following order: **1 point**

- point-source model, line-source model, uniform piston-driven model, mode-matching
- line-source model, point-source model, uniform piston-driven model, mode-matching
- mode-matching, uniform piston-driven model, line-source model, point-source model

No, the answer is incorrect.
Score: 0

Accepted Answers:
point-source model, line-source model, uniform piston-driven model, mode-matching

4) For the flow-reversal rectangular muffler of cross-dimensions B and H, and short axial length $L(L/B << 1 \text{ and } L/H << 1)$ shown below, the optimal location of the end-inlet port (x_1, y_1) and end-outlet port (x_2, y_2) in context of obtaining a broadband acoustic attenuation is given by **1 point**



- $x_1 = 0.5B,\ y_1 = 0.5H,\ x_2 = 0.75B,\ y_2 = 0.75H,$
- $x1 = 0.5B,\ y1 = 0.5H,\ x2 = 0.5B,\ y2 = 0.5H,$
- $x1 = 0.75B,\ y1 = 0.75H,\ x2 = 0.75B,\ y2 = 0.75H,$
- $x1 = 0.25B,\ y1 = 0.25H,\ x2 = 0.75B,\ y2 = 0.75H,$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$x_1 = 0.5B,\ y_1 = 0.5H,\ x_2 = 0.75B,\ y_2 = 0.75H,$

5) Considering a uniform piston-driven model and sound speed $c_0 = 343.14m/s$, the first attenuation peak f_p and the corresponding end-correction length l_{ec} for the flow-reversal circular chamber configuration shown below with $R_0 = 125mm,\ L = 300mm,\ d_0 = 40mm,$ $\delta_{E1} = 0,\ \delta_{E2} = 78.45mm$ will occur at **1 point**

- 285.9 Hz, 0
- 313.1 Hz, 26 mm
- 345.4 Hz, 51.6 mm,
- 320 Hz, 31.9 mm

No, the answer is incorrect.
Score: 0

Accepted Answers:
313.1 Hz, 26 mm

6) For the flow-reversal configuration shown in Q.5 with the same physical dimensions, the first axial trough will occur at **1 point**

- 571.9 Hz,
- 626.2 Hz,
- 690.7 Hz,
- 550.1 Hz

No, the answer is incorrect.
Score: 0

Accepted Answers:
571.9 Hz,

7) Consider an end-inlet and side-outlet circular muffler where axial length to chamber diameter ratio, i.e., $L/D > 1$. To obtain the maximum possible broadband attenuation range, the following port locations are recommended: **1 point**

- end-centered inlet port and side-outlet port located at L/4
- end-offset port which is offset on the nodal circle of the (0,1) radial mode and side-outlet located at L/2
- end-centered inlet port and side-outlet located at L/2
- end-offset inlet port (on the pressure node of the (0,1) radial mode) and side-outlet port located at L/4

No, the answer is incorrect.
Score: 0

Accepted Answers:
end-centered inlet port and side-outlet located at L/2

8) Consider an axially long side-inlet and side-outlet uniform circular muffler configuration. The optimal port location to obtain the maximum possible broadband attenuation is given by **1 point**

- side-inlet located at L/2 and side-outlet located at L/4 with relative or included angle between the ports equal to 90 degrees
- side-inlet located at L/2 and side-outlet located at 3L/4 with relative or included angle between the ports equal to 90 degrees
- side-inlet located at L/4 and side-outlet located at 3L/4 with relative or included angle between the ports equal to 90 degrees
- side-inlet located at L/2 and side-outlet located at L/4 with relative or included angle between the ports equal to 180 degrees
- side-inlet located at L/2 and side-outlet located at L/4 with relative or included angle between the ports equal to 0 degrees

No, the answer is incorrect.
Score: 0

Accepted Answers:
side-inlet located at L/2 and side-outlet located at L/4 with relative or included angle between the ports equal to 90 degrees
side-inlet located at L/2 and side-outlet located at 3L/4 with relative or included angle between the ports equal to 90 degrees

9) In Q.8, consider the chamber diameter $D_0 = 250mm$, chamber length L = 300 mm, port diameter $d_0 = 40mm$, take sound speed $c_0 = 343.14m/s$. For the optimal locations of side-inlet and side-outlet ports, the first two attenuation peaks occur at **1 point**

- 571.9 Hz, 804.4 Hz
- 571.9, 1143.8 Hz
- 804.4 Hz, 1143.8 Hz
- 571.9 Hz, 987 Hz

No, the answer is incorrect.
Score: 0

Accepted Answers:
571.9 Hz, 804.4 Hz

10) For a single-inlet and double-outlet muffler system with inlet port 1 and outlet ports 2 and 3, the transmission loss (TL) in terms of the scattering matrix parameters is given by **1 point**

- $TL = 10\ log_{10}\left[\frac{\frac{1}{Y_1}}{\frac{|S_{21}|^2}{Y_2}+\frac{|S_{31}|^2}{Y_3}}\right]$
- $TL = 10\ log_{10}\left[\frac{\frac{1}{Y_2}}{\frac{|S_{12}|^2}{Y_1}+\frac{|S_{32}|^2}{Y_3}}\right]$
- $TL = 10\ log_{10}\left[\frac{\frac{1}{Y_3}}{\frac{|S_{13}|^2}{Y_1}+\frac{|S_{23}|^2}{Y_2}}\right]$
- $TL = 10\ log_{10}\left[\frac{\frac{1}{Y_1}}{\frac{|S_{11}|^2}{Y_1}+\frac{|S_{21}|^2}{Y_2}+\frac{|S_{31}|^2}{Y_3}}\right]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$TL = 10\ log_{10}\left[\frac{\frac{1}{Y_1}}{\frac{|S_{21}|^2}{Y_2}+\frac{|S_{31}|^2}{Y_3}}\right]$