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CHAPTER

Noise Pollution

Q.1 The sound pressure for a jet plane on the ground with sound pressure of 2500 μ bar should be
(a) 140 dB
(b) 142 dB
(c) 144 dB
(d) 146 dB

Q.2 Consider the following statements:
1. 1ne dB is the fair test sound which can be perceived by human ear and the maximum sound which can be tolerated by human ear is about 200 dB.
2. Sound intensity varies as square of sound pressure.
Which of these statement/s is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Q.3 What type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials?
(a) Source noise
(b) Reflection noise
(c) Structural noise
(d) Direct airborne noise

Q.4 Two sources generate noise levels of 90 dB and 94 dB respectively. The cumulative effect of these two noise levels on the human ear is

(a) 184 dB
(b) 95.5 dB
(c) 94 dB
(d) 92 dB

Q.5 Which of the following pairs are correctly matched?

1. Reverberation time	: Time required to reduce noise by 60 dB
2. NIPTS	: Responsible for permanent hearing loss
3. Sound foci	: Formed when sound waves are reflected from convex surface
4. TTS	: Responsible for temporary hearing loss

Select the correct answer using the codes given below:
(a) 2, 3 and 4
(b) 1, 3 and 4
(c) 1, 2 and 4
(d) 1, 2 and 3

Q.6 Consider the case where noise level of 90 dBA exists for 5 minutes and is followed by reduced noise level of 60 dBA for 50 min. The equivalent continuous energy level (L_{eq}) for 55 minutes period is
(a) 70.00 dB
(b) 79.63 dB
(c) 59.26 dB
(d) 84.21 dB

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Explanations **Noise Pollution**

1. **(b)**

Sound pressure level (dB) $= 20 \log_{10} \left(\dfrac{P}{P_0} \right)$

Where, P is sound pressure in N/m^2

P_0 is reference pressure $(2 \times 10^{-5} N/m^2)$

For given sound pressure,

$P = 2500 \, \mu \, bar = 250 \, N/m^2$

$\therefore \quad SPL = 20 \log \left(\dfrac{250}{2 \times 10^{-5}} \right) = 142 \, dB$

2. **(b)**

The maximum sound which can be tolerated by human ear is about 180 dB.

3. **(c)**

Sound absorbing materials reflect the noise and they are mostly used in theatres etc.

4. **(d)**

The cumulative effect of these two noise levels will be between 90 dB and 94 dB.

$\bar{L}_p = 20 \log \left[\dfrac{1}{N} \sum_{n=1}^{N} (10)^{L_n/20} \right]$

$= 20 \log \left[\dfrac{1}{2} \times \left(10^{90/20} + 10^{94/20} \right) \right]$

$= 92.2 \, dB$

5. **(c)**

Reverberation time is the time required to reduce the intensity to one-millionth of its initial value.

Sound level (dB) $= 10 \log \left(\dfrac{I_1}{I_2} \right)$

$= 10 \log (10^6) = 60 \, dB$

TTS (Temporary Threshold Shift) is temporary impairment of hearing acuity as indicated by change in the threshold of audibility.

PTS (Permanent Threshold Shift) is related to permanent hearing loss.

The sound loci are formed when sound waves are reflected from concave surface.

6. **(b)**

$L_{eq} = 10 \log \sum_{i=1}^{n} \left[(10) \dfrac{L_i}{10} \times t_i \right]$

$\therefore L_{eq} = 10 \log \left[(10)^{90/10} \times \dfrac{5}{55} + (10)^{60/10} \times \dfrac{50}{55} \right]$

$= 10 \log \left[10^9 \times \dfrac{1}{11} + 10^6 \times \dfrac{10}{11} \right]$

$= 10 \log [91818181.82] = 79.629 \, dB$

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