43 (6) ARC 6·6

2017

BUILDING SERVICES–IV

Paper : ARC 6·6

(Acoustics)

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Fill in the blanks : 5×1=5

   (a) The unit of absorption is the open window unit which is called a _____.

   (b) The middle ear cavity contains air at atmospheric pressure due to the _____ which connects to the throat.

   (c) Velocity of sound in bricks is _____.

   (d) 'The whispering gallery effect' is also known as _____.

   (e) The scale for measuring intensity of sound is the _____ scale.

2. Write short notes : ***(any six)*** 5×6=30

(a) Frequency and Pitch of sound

(b) Helmholtz Resonant Absorbers

(c) Sound absorption coefficients

(d) Reverberation time

(e) Masking of sound

(f) Inverse square law

(g) Flanking of sound.

3. What is Acoustics ? Why acoustics is studied in the field of Architecture ? 5+5=10

4. Answer the following : ***(any three)*** 3×10=30

(a) Discuss behavior of sound within enclosed space.

(b) Explain with neat sketches different acoustical defects, their causes and remedies.

(c) Discuss acoustical design considerations for auditorium with needful sketches.

(d) What is sound insulation ? Discuss different types of sound insulating materials.

5. What is intensity of sound ? 1+3+3+3=10

A car horn outdoor produces a sound intensity level (loudness) L_1 of 90 *dB* at 10*ft* away.

(i) Find the sound intensity I_1 at a location $10ft$ away

(ii) Find the sound intensity I_2 at a location $80ft$ away

(iii) What will be the difference in sound intensity level (loudness) between both the locations ?

Or

Define Transmission loss (TL).

A $3ft$ by $7ft$ louvered door which has a TL of $10dB$ at $500Hz$ is located in one wall of a conference room. The $18ft$ long by $8ft$ high wall with a TL of $45dB$ at $500Hz$ is staggered wood stud construction with two layers of gypsum board on both sides. Find the composite TL at $500Hz$ for this wall-door construction.

6. An auditorium, rectangular in shape, has the following dimensions : Length=$35m$, breadth=$25m$, and height=$9m$. The internal areas of different surfaces are as follows : Cement plaster : $800m^2$; Concrete floor : $700m^2$; Timber floor : $200m^2$; Plaster of paris ceiling : $600m^2$. The capacity of the auditorium is 1050 seats (chairs, upholstered seat with spring). If absorption co-efficient are : Cement plaster : 0·02; Concrete floor : 0·03; Timber floor : 0·09; Suspended ceiling : 0·05; Upholstered chair : 0·16; Person : 0·30, determine the following : 10+5=15

(a) Number of absorbing units and time of reverberation when there is *(i)* no audience *(ii)* one third audience *(iii)* two-third audience *(iv)* full audience.

(b) Number of extra absorbing units required so as to get an optimum reverberation time of 1·2 seconds when the strength of the audience is two-third of its capacity.

Or

Define Noise. Discuss classification of Noise and effects of Noisy condition.

In an apartment building, two adjacent living rooms have a party wall constructed of 4 inches thick brick which has a TL of 40*dB* at 500*Hz*. The surface area 'S' of the wall is 200ft^2 and both rooms have 300 sabins of absorption a_2 at 500*Hz*. Find the sound level L_2 in room 2 if the sound L_1 in room 1 is 74*dB*. 2+8+5=15