B. Architecture Examination ,2018

(4th Year, 2nd Semester) (Old)

ARCHITECTURAL ACOUSTICS

Full Marks (Sections A and B) 100

Time : Three hours

Answer any two questions from each sections

The answers should be exact and precise.

The figures in the margin indicate full marks.

Use separate answer scripts for each sections.

Section A	Marks 50

Q.1 (a) Explain the octave bands in detail with their centre frequencies. What is significance of the unit of decibel ? What is the utility of one third octave bands ? 　　　　　　　　　　　10

(b) What is sound pressure level(SPL)? What is its significance? What are the sound pressure levels of thresholds of audibility and pain? What are the change in sound intensity level for human perception of clearly noticeable sound? 　　　　　　5

(c) The sound level at a distance R1 from a source in an open space is S1 dB,. Calculate the sound level due the same source at a distance of R2 from it. The source is non directional and radiates equally in all directions. 　　　　　　　　　　　10

Q.2 (a) What are sound fields, and line source? Give the sound level variations for near field, far field, free field and reverberant field in a room. Also give the sketch sound level with distance in two rooms – one room with a greater amount of absorption than the other.   10

(b) Explain the adding and subtracting of sound levels.   5

(c) Explain the operation of sound level meter. Discuss the human ear sensitivity.   10

Q.3(a) Discuss the Haas effect in detail. Explain the integration and echo zones for a delayed sound. How Haas effect can be used to design an auditorium?   10

(b) Explain the following:

(i) Sound masking   (ii) Equal loudness contours.   10

(c) Make a comparison of the blending ability of ear with blending ability of eye for cinematographic pictures to give impression of motion.   5

Q.4 (a) What is the condition for not observing echo? Explain the impulse diagram of room with perfect diffuse field and also with sound focussing elements.   10

b) What is reverberation time? What is Sabine equation? Define the unit Sabine and limitation of Sabine equation.   10

(c)Discuss the reverberation time and speech intelligibility.   5

Section B   Marks 50

Q.5 (a) Discuss the effect of frequency of incident sound wave and size of the obstacle on the formation of acoustic shadow zone due to diffraction.   10

(b) What do you understand by specular and diffuse reflection of sound? On what factors does diffuse reflection depend?   10

(c) What is the principle of designing cylindrical and domical diffusers?

5

Q.6 (a) Discuss how the percentage of diffracted sound increases when an opening size is reduced. What happens when the opening is very small compared to the wavelength of the sound?   10

(b) What are the limitations of cylindrical and domical diffusers? How are they overcome? Explain.   15

Q.7 (a) Discuss higher order image formation by specular reflection of sound. Extend this idea for images produced by two long parallel reflecting walls using a neat diagram.   15

(b) Write short notes on volume absorber of sound.   10

Q. 8 (a) Define Noise Reduction Coefficient. How do we define sound absorption of a material? Find the average absorption coefficient of a room of size 20m X 30m X 9m if the absorption coefficients of the ceiling, wall and floor are 0.6, 0.01 and 0.2 respectively.   15

(b) Discuss the relevance of acoustic shadow zone mentioning both favourable and unfavourable situations.   10