

BACHELOR OF ARCHITECTURE
FIFTH YEAR FIRST SEMESTER EXAM 2025
ARCHITECTURAL ACOUSTICS

Time: 3 hours

Full Marks: 100

Instruction: Answer Question No. 1 and any five of the rest. Answer all the sub-parts of a question together.

	Question No. 1 carries 20 marks while the rest are of 16 marks each.	Marks
1.	Part – A: Justify your answer by selecting the correct alternative. (2 x 5=10) a) Which of the sound qualities is NOT desired in a recording room? i) Diffused sound, ii) Specular sound, iii) Uniform sound, iv) Scattered sound b) What is the dB SPL of an auditorium with contemporary music? i) 80-95, ii) 85-90, iii) 95-100, iv) 100-105 c) Critical path is the distance where the SPL of direct sound: i) matches the SPL of background noise, ii) matches the SPL of early reflections iii) exceeds the SPL of early reflections, iv) is zero d) What is the Required time for any sound to decay to 60 dB? i) Echo time, ii) Delay time, iii) Reverberation time, iv) Transient time e) Which parameter is affected by the distance between the listener and the source of the sound? i) Volume, ii) Bass, iii) Treble, iv) Loudness Part – B: Compare the following terms: ($2\frac{1}{2} \times 4 = 10$) a) Echo and Flutter Echo b) Decibel (dB) and dBA c) Sound Transmission Class (STC) and Impact Isolation Class (IIC) d) Absorption Coefficient and Reflection Coefficient	20
2.	(a) Classify and compare the characteristics and behavior of sound in an enclosed space. (b) How do the boundary conditions play a role in the determination of the phenomena of absorption and reflection with reference to the airborne and structure-borne sound transmission? (c) From the perspective of room acoustics differentiate between - i) Early & Late Reflection & ii) Specular & Scattered Reflection	5 + 5 + (3+3)
3.	(a) Enlist in details the steps to be followed during an Acoustical Design Process starting from the requirements of the client to selection of the raw materials, developing the design and implementation of the same. (b) Give examples of surfaces and materials which help in reflection and absorption.	13 + 3
4.	Generate and discuss in details a flowchart for a successful Digital (a) Recording and (b) Playback Process in a controlled acoustical system.	8 + 8
5.	(a) How can we define speech intelligibility? (b) Cite the reasons for decreased intelligibility. (c) What are the fundamental requirements in designing rooms for speech? (d) Briefly discuss the acoustical planning for a lecture room with a seating capacity of 45 students.	2 + 3 + 6 + 5
6.	(a) Define Reverberation Time (RT). (b) Write an expression for the Sabine's formula and mention the factors that control RT. (c) Calculate the RT of a room in empty condition and having following data: Dimension: $10m \times 20m \times 5m$ (Height). All surfaces are having a sound absorption coefficient 0.1. (d) If a sound having intensity 0.5 W/m^2 is successive reflected in a room by 50 times on the surfaces having sound absorption coefficient 0.2, then what will be the final intensity of sound?	2 + 4 + 6 + 4
7.	(a) Discuss the various categories of ambient noise. (b) What are the major considerations on site design that can have a major impact on acoustics in health-care environments? (c) Prepare a list to assess the Noise sources affecting any acoustic design, and accordingly examine the constraints to control the noise.	3 + 5 + 8
8.	(a) What do you mean by near-field and far-field propagation of sound? (b) How do we measure the Sound intensity level for cylindrical propagation. (c) Compute the difference in the Pressure Level if the distance of separation is doubled than the previous one.	4 + 4 + 8
9.	Compare the architecture from the different era with respect to the acoustical design. Comment on the perspective of evolution of the materials and design fundamentals as well.	12 + 4