Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Program Name: B. Tech ADE **Semester : VII**
Course Name: Noise Vibration and Harshness **Time : 3 hrs**
Course Code: MECH4039 **Max. Marks : 100**

Instructions: Attempt all the questions. Assume any missing data if required.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Tabulate the key differences between plane waves and spherical waves.	**4**	**CO1**
Q 2	Enlist the techniques to reduce interior noise in automobiles	**4**	**CO1**
Q 3	Discuss the source of Low frequency vibrations in automobile.	**4**	**CO1**
Q 4	Define brake squeal noise and pass-by noise in concern to automobile engineering.	**4**	**CO1**
Q 5	Brief explain the applications of the Wave Equation in Acoustics.	**4**	**CO1**
SECTION B **(4Qx10M= 40 Marks)**			
Q 6	Establish the relationship between sound power level and sound intensity level, and between sound intensity level and sound pressure level.	**10**	**CO2**
Q 7	In a spring-mass-dashpot system k = 40 kN/m, m = 120 kg, and the damping provided is only 20% of the critical value. Determine (i) the damping ratio (ii) the critical damping coefficient (iii) the natural frequency of damped vibration (iv) the logarithmic decrement		
Q 8	Write your viewpoint on the effect and acceptable degree of harshness. Also discuss the psychological effects of noise & vibrations on human beings.	**10**	**CO2**
Q 9	Explain in brief the octave band analysis. An octave band analysis was done on an automobile. It was found that the octave band sound pressure levels were 93 dB at 250 Hz, 94 dB at 1000 Hz, 96 dB at 2000 Hz, 94 dB at 8000 Hz. Determine the total mean square pressure. OR	**10**	**CO2**

	Explain various sound measurement techniques in brief. Also, discuss the noise control techniques, and noise absorbing materials and structures.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	Explain the characteristics and source of vibration for the following power train components. a) Engine (b) Clutch (c)Transmission (d) Propeller shaft	**20**	**CO3**
Q 11	An engine of an automobile weighing 200 kg is mounted on spring having stiffness k=10790 N/cm. A piston within the engine weighing 2.2 Kg has a reciprocating motion with a stroke of 7.5 cm and a speed of 6000 rpm. Assuming the motion to be simple harmonic, determine; (a) The amplitude of vibration of the machine and (b) The transmissibility and force transmitted to the ground. Take the damping ratio as 0.2. OR A four-wheeler vehicle is a complex with many degrees of freedom. As a first approximation let it be assumed that the vehicle is constrained to move in vertical direction and that tires do not provide any spring effect. A vehicle of this type weighs 9.8 kN when fully loaded and 2.45 when empty. The effective spring constant is 3.5 kN/cm, and the damping factor is 0.5 when vehicle is fully loaded. The speed of vehicle is 96 km/hr and the road surface may be assumed sinusoidal with a period of 4.88 minutes and an amplitude X_1 cm, determine the amplitude ratio of vehicle when fully loaded and empty.	**20**	**CO3**