


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	Enlist the noise levels in automobiles.	4	CO1
Q 2	Explain the concept of passive and active suspensions in brief.	4	CO1
Q 3	Explain fundamentals of acoustics involve the study of sound waves.	4	CO1
Q 4	Define squeak noise and rattle in concern to automobile engineering.	4	CO1
Q 5	Tabulate the key differences between air born sound and structure borne sound in concern to automobile.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	Discuss various NVH legislations applicable for vehicles in India. Alos, Discuss the relevant regulations and explain the framework established by the Central Motor Vehicle Rules (CMVR) for enforcing and monitoring compliance with these noise level standards.	10	CO2
Q 7	For a spring mass damper system, $m = 50$ kg and $k = 5000$ N/m. Find the following (i) critical damping constant c_c , (ii) damped natural frequency when $c = c_c/2$ (iii) logarithmic decrement.		
Q 8	Explain the concept of decibel scale. If three sound sources of SPL 90, 92 and 88 operate simultaneously, determine the total sound pressure level by exact and approximate method.	10	CO2
Q 9	Define the specific acoustic impedance. Also discuss its characteristics and importance.	10	CO2
OR			

	Explain the active and semi-active noise control techniques. Also, discuss various types of anechoic chambers their application, challenges and advancements.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	Explain the characteristics and source of vibration for the following power train components. a) Differential (b) Drive shaft (c) Trans axle (d) Power train mounts	20	CO4
Q 11	The static deflection of an automobile on its spring is 10 cm. Find the critical speed when the automobile is travelling on the road, which can be approximated by a sign wave of amplitude 8 cm and a wavelength of 16 m. Assume the damping coefficient to be 0.05. Also determine the amplitude of vibration at 75 km/ph. OR An engine of an automobile weighing 250 kg is mounted on spring having stiffness $k=11000$ N/cm. A piston within the engine weighing 2.25 Kg has a reciprocating motion with a stroke of 7.25 cm and a speed of 3000 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 0.1.	20	CO4