

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Noise vibration and harshness

Programme: M.Tech Advanced Vehicle

Course code: MEAV7006

Semester: I

Time: 3 hrs.

Max. Marks: 100

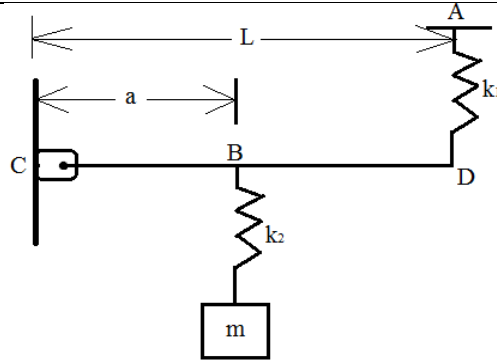
Instructions: All the questions are compulsory. Assume suitable data if missing.

SECTION A
(5Qx4M=20Marks)

Q.1	Justify the statement “Vibration analysis of a non-linear system involves much complexities”	4	CO1
Q.2	Establish a relation between sound intensity level and sound pressure level.	4	CO1
Q.3	Discuss the source of Low frequency vibrations in automobile.	4	CO1
Q.4	Discuss the road vehicles noise standards.	4	CO1
Q.5	Briefly explain the wind noise, and squeak noise & rattle	4	CO1

SECTION B
(4Qx10M= 40 Marks)

Q.6	Write your view point on the effect and acceptable degree of harshness. Also discuss the psychological effects of noise & vibrations on human beings.	10	CO1
Q.7	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.8	Discuss the working principal of a vibration pick-up. A commercial type vibration pickup has a natural frequency of 6 Hz and a damping factor of 0.65. Find the lowest frequency beyond which the amplitude can be measured within one percent error.	10	CO2
Q.9	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. OR Derive the expression of natural frequency for the system shown in. Assume the bar CD to be weightless and rigid.	10	CO2



SECTION-C
(2Qx20M=40 Marks)

Q.10	<p>Explain the characteristic and source of vibration for the following power train components; Differential (b) Drive shaft (c) Trans axle (d) Power train mounts</p>	20	CO3
Q.11	<p>The springs of an automobile trailer are compressed 0.1 m under its own weight. Find the critical speed when the trailer is travelling over the road with a profile approximated by a sine wave of amplitude 0.08 m and length 14 meters. Also, find the amplitude of vibration at 60 km/hr.</p> <p style="text-align: center;">OR</p> <p>An engine of an automobile is 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;</p> <p>(a) The amplitude of vibration of the machine and (b) The transmissibility and force transmitted to the ground.</p> <p>Take the damping ratio as 0.2.</p>	20	CO3