Graphic Era
HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Even) Semester Examination March 2025

Roll no.............................

Name of the Course: B. Tech. (Mechanical Engineering)
Semester: VI
Name of the Paper: *Mechanical Vibrations*
Paper Code: TME610
Time: 1.5-hour

Maximum Marks: 50

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1			
(a)	Add the following two motions analytically and check the solution graphically. $x_1 = 8 \sin(\omega t + 30°)$ $x_2 = 10 \cos(\omega t - 60°)$	(10 marks)	CO1
	OR		
(b)	i. Express the complex number $3 + j4$ in exponential form. ii. Express the exponential number $9e^{j0.3}$ in complex form.		
Q2			
(a)	Represent the periodic motion shown in figure 1 by Harmonic series	(10 marks)	CO1
	OR		
(b)	Represent the periodic motion shown in figure 2 by Harmonic series		
Q3			
(a)	Give Examples of following by a neat sketch i. Longitudinal undamped free vibrations ii. Transverse undamped free vibrations iii. Torsional damped free vibrations	(10 marks)	CO1
	OR		
(b)	Define the following terms related to vibrations i. Natural frequency ii. Period iii. Resonance iv. Degree of freedom v. Simple Harmonic Motion		
Q4			
(a)	Determine the equations of the motions and natural frequency of the system shown in Figure 3	(10 marks)	CO1 CO2
	OR		
(b)	Split the harmonic motion $x = 10 \sin(\omega t + 30°)$ into two harmonic motions one having a phase angle of zero and the other of $45°$		
Q5			
(a)	Determine the equations of the motions and natural frequency of the Simple pendulum mass m, length l, spring of stiffness k attached at distance a, from hanging point. (Fig. 4)	(10 marks)	CO2
	OR		
(b)	Determine the equations of the motions and natural frequency of system shown in Fig. 5.		

(1)

(2)

(3)

(4)

(5)