Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3160109 Date: 26-05-2025

Subject Name: Theory of Vibration

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	What are the main causes of Vibration? Write down the advantages and disadvantages of vibration.	**03**
	(b)	Describe the Vector method of representing harmonic motion.	**04**
	(c)	Derive differential equation of motion by the energy method and Rayleigh's method.	**07**
Q.2	**(a)**	Define: Natural Frequency, Damping Ratio, Time Period.	**03**
	(b)	Define: Damped natural frequency, Periodic motion, Amplitude, Degree of freedom.	**04**
	(c)	Explain under damped, over damped and critically damped systems with graph.	**07**
		OR	
	(c)	Define logarithmic decrement. Also Derive the expression for logarithmic decrement.	**07**
Q.3	**(a)**	Explain the types of vibrations in brief.	**03**
	(b)	Derive the expression for frequency of free damped vibrations?	**04**
	(c)	Derive solution for Spring mass damper system with harmonic force.	**07**
		OR	
Q.3	**(a)**	Explain Critical speed or Whirling speed of shaft.	**03**
	(b)	What's the difference between single and double degrees of freedom?	**04**
	(c)	What is vibration absorber and vibration isolator? With neat sketch explain the working of Vibration absorber. Also explain its need.	**07**
Q.4	**(a)**	Define Transmissibility. Briefly explain the concept of support motion.	**03**
	(b)	Write down the equation of motion for damped free vibration. Derive the solution for that equation.	**04**
	(c)	Explain how vibration and frequency measuring devices work? Explain any one of the vibration measuring instrument in detail.	**07**
		OR	
Q.4	**(a)**	Discuss, the Principal modes of vibrations	**03**
	(b)	Define: Multi degree of freedom system. Name the various methods used to analyze these systems.	**04**
	(c)	Derive the solution: $m\ddot{x} + c\dot{x} + kx = F \sin \omega t$.	**07**
Q.5	**(a)**	Discuss the reciprocity theorem in brief.	**03**
	(b)	What is the vibration of a continuous system? Explain in brief: Vibration of strings	**04**
	(c)	Derive an expression for frequency of torsional vibration of two rotorsystems.	**07**
		OR	
Q.5	**(a)**	What is Resonance? How it can be avoided?	**03**
	(b)	Explain in detail the Galerkin's Method.	**04**
	(c)	Write a note on Co-ordinate Coupling.	**07**

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