Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2160109 **Date: 25/10/2016**

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.**

Q.1	**(a)**	What is Damping? Why it is needed? Explain Coulomb damping.	**07**
	(b)	Derive the solution of equation motion of damped free vibrations. Also explain Over damped system.	**07**
Q.2	**(a)**	Explain Rayleigh's method to derive the equation of motion using an example. Also mention the significance of this method.	**07**
	(b)	The motion of a particle is given by x=10sinwt. Sketch the relative positions and magnitudes of the displacement, velocity and acceleration vector at time t = 0; when (1) w = 2.0 rad/sec and (1) w = 0.5 rad/sec	**07**
		OR	
	(b)	A mass of 1.5 kg is to be supported on a spring having a stiffness of 9800 N/m. The damping coefficient is 4.9 N-s/m. Determine the natural frequency of damped vibrations. Also find the logarithmic decrement and the amplitude after three cycles if the initial displacement is 0.30 cm.	**07**
Q.3	**(a)**	Define Damping. Explain Viscous damping and Structural damping.	**07**
	(b)	Explain:	
		1. Use of critical damping	**03**
		2. Steady state and Transient Vibrations	**04**
		OR	
Q.3	**(a)**	With neat sketch explain Critical Speed of Shaft.	**07**
	(b)	A shock absorber is to be designed so that its overshoot is 10% of the initial displacement when released. Determine the damping factor. If the damping factor is reduced to one half this value, What will be the Overshoot?	**07**
Q.4	**(a)**	Explain in brief:	**07**
		1. Logarithmic Decrement	
		2. Torsionally Equivalent shaft	
	(b)	An electric motor is supported on a Spring and a dashpot. The spring has the stiffness of 6400 N/m and the dashpot offers resistance of 500 N at 4 m/s. The unbalanced mass 0.5 kg rotates at 5 cm radius and the total mass of vibratory system is 20 kg. The motor runs at 400 rpm. Determine:	**07**
		(a) Damping factor (b) amplitude of vibration and phase angle (c) resonant speed and resonant amplitude (d) forces exerted by spring and dashpot on the motor.	
		OR	
Q.4	**(a)**	Write a short note on Beats phenomenon.	**07**
	(b)	Define and explain fundamental frequency. Explain the methods of decreasing vibrations in an existing system.	**07**
Q.5	**(a)**	Write a short note on Vibration measuring instruments.	**07**
	(b)	Write a short note on Frequency measuring instruments.	**07**
		OR	

Q.5	**(a)**	With neat sketch explain the working of Vibration absorber. What is the difference between absorber and isolator?	**07**
	(b)	For free torsional vibrations of a two rotor system prove that angular displacements of the rotors are inversely proportional to their moment of inertias?	**07**

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