Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2160109 **Date:16/05/2019**

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**

			MARKS
Q.1	**(a)**	Explain Simple Harmonic Motion with an example.	**03**
	(b)	Explain the Energy method for vibration analysis.	**04**
	(c)	Define the following terms: Degrees of Freedom, Natural Frequency, Node, Damping Ratio, Resonance, Time Period, Damped natural frequency	**07**
Q.2	**(a)**	Define Damping. Explain Damped and Undamped Vibration.	**03**
	(b)	Explain series and parallel spring connections.	**04**
	(c)	Show that for finding natural frequency of a spring mass system, the mass of the spring can be taken into account by adding one third its mass to the main mass.	**07**
		OR	
	(c)	Determine the natural frequency of torsional pendulum having following characteristics: Length of the rod: 1 m Diameter of the rod (d): 5 mm Diameter of the rotor (D): 0.2 m Mass of the rotor: 2 kg Modulus of rigidity (G): 0.83×10^{11} N/m^2	**07**
Q.3	**(a)**	How many ways you can control the vibration?	**03**
	(b)	Show that in case of a Coloumb damping the reduction in amplitude takes place by an amount of 4F/k in one complete cycle.	**04**
	(c)	Conclude the response of Overdamped, Underdamped and Critically damped system by solving differential equation of undamped free vibration with neat sketches.	**07**
		OR	
Q.3	**(a)**	State the applications of critical damping in real life examples.	**03**
	(b)	Explain Logarithmic decrement.	**04**
	(c)	An electric motor is supported on a spring and a dashpot. The spring has stiffness of 6400 N/m and a dashpot offers resistance of 500 N at a velocity of 4 cm/sec. The unbalanced mass of 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: Damping factor, amplitude of vibration and phase angle, resonant speed and resonant amplitude, forces exerted by the spring and dashpot on the motor.	**07**
Q.4	**(a)**	State the role of spring mass and damper in any vibratory system.	**03**
	(b)	Discuss working of a Vibrometer.	**04**
	(c)	Derive the solution of equation of motion for forced vibration for spring mass damper system under the influence of harmonic force.	**07**
		OR	
Q.4	**(a)**	Show the response of transient and steady state vibration.	**03**

	(b)	Show the working of Frahm's Tachometer to determine the frequency of vibration body.	**04**
	(c)	Explain the torsional vibration of two rotor system. Determine the natural frequencies and mode shapes.	**07**
Q.5	**(a)**	State the importance of Vibration isolation. Explain different materials used for vibration isolation.	**03**
	(b)	Explain the working of Vibration absorber with neat sketch.	**04**
	(c)	Using Lagrange's equation, determine the natural frequency of the system shown in fig. 1.	**07**

OR

Q.5	**(a)**	Compare the vibration absorber with vibration isolator.	**03**
	(b)	Explain Rayleigh's method for finding natural frequency of transverse vibration of beams.	**04**
	(c)	Determine the two natural frequencies of vibration and the ratio of amplitudes of motion m1 & m2 for the two mode of vibration for the system shown in fig.2 Take m1= 1.5 kg , m2= 0.80 kg, k1=k2= 40 N/m.	**07**

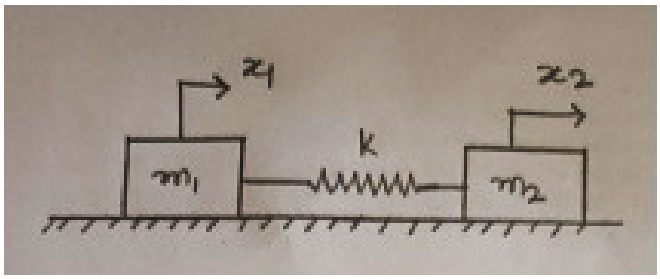

fig.1

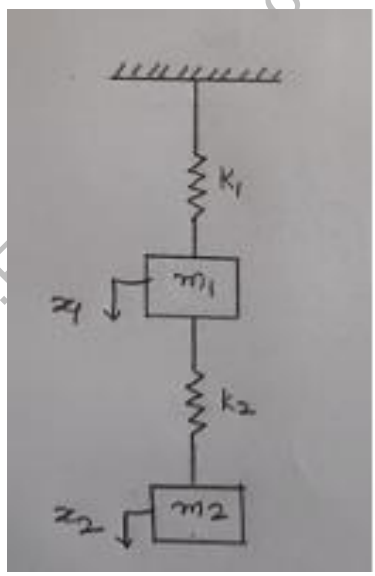

fig.2