Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012

Subject code: 160103 **Date: 04/01/2013**

Subject Name: Vibration and Noise Control

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	i.	Explain torsional oscillations.	**03**
		ii.	Find the natural frequency of torsional oscillations for the system shown in Figure 1. J = 14.7 kg-m2 and G = 0.83 x 10^{11} N/m2	**04**
	(b)		1) Derive the expression for work done by a harmonic force on harmonic motion.	**04**
			2) Explain fluid dash-pot damping using suitable figures and equations.	**03**
Q.2	**(a)**		A rotating m/c having a mass of 1200 kg has an unbalanced mass of 1 kg located at 6.0 cm radius. Assume the damping factor to be 0.1. Find out the amplitude of vibration if the m/c is operating at a speed of 1440 rpm. Resonance occurs at 231.44 rad/sec. Prove that for an undamped system the amplitude is higher than that of damped system.	**07**
	(b)		In forced vibration derive and explain the role and significance of complementary and particular solution in detail along with the sketches showing the variation of these with time, indicating frequency.	**07**
			OR	
	(b)	i.	Explain beats with a neat and labeled sketch.	**03**
		ii.	A body has two simultaneous motions given by x1= a sinw1t and x2=asinw2t, where w1 is only slightly higher than w2. Find the slope of the resultant beat.	**04**
Q.3	**(a)**		Determine and sketch the normal modes of transverse vibration of a simply supported beam of length L and uniform c/s.	**07**
	(b)	i.	Explain longitudinal vibration of bars	**05**
		ii.	Sketch and indicate the degrees of freedom for two degree and four degree of freedom systems. Give two examples each.	**02**
			OR	
Q.3	**(a)**		Derive the equation for logarithmic decrement for underdamped system.	**07**
	(b)		Determine the equation of motion for the system shown in figure 2. Also determine the critical damping co-efficient for the dash-pot.	**07**
Q.4	**(a)**	i.	Describe main causes of vibration and the remedies	**03**
		ii.	Describe magnification factor in detail and sketch the relevant graphs	**04**
	(b)	i.	Explain giving two examples each: Springs in series and Springs in parallel	**02**
		ii.	Explain isolation using springs and dampers. Sketch the relevant graphs and explain the conclusions from that graph.	**05**
			OR	
Q.4	**(a)**		Derive the equation for natural frequency for the double pendulum having two equal masses of mass M kg and rods of equal length L m.	**07**

Q.4 **(b)** Explain vibration isolation of two degree of freedom system using suitable example. **07**

Q.5 **(a)** Explain rotating unbalance in a machine in detail and derive the relations **07**

(b) i. Explain the difference between forced vibration and free vibration. Give examples of forced vibration **03**

ii. Derive the force free response of a second order system in terms of its initial conditions. **05**

OR

Q.5 **(a)** Explain Maxwell's theorem using suitable example. **07**

(b) A single cylinder engine drives a pump with flywheel connected in-between and forms the equivalent three rotor system. The mass moment of inertia of engine, flywheel and pump are 0.135Kg-m^2, 0.3 Kg-m^2 and 0.09 Kg-m^2 respectively. The shaft of diameter 60 mm has total length of 2.5 m and shaft length between engine and flywheel is 1.5 m. The modulus of rigidity of shaft material is 80 x 10^9 N/m^2. Determine the natural frequency for two node system. **07**

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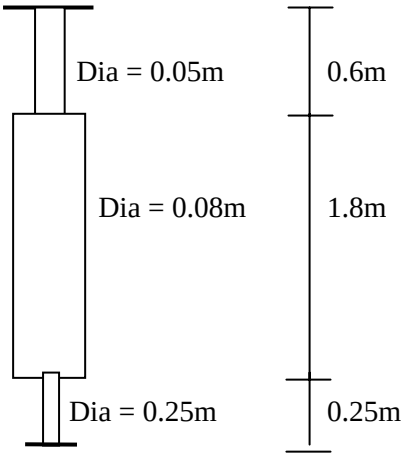

Figure 1

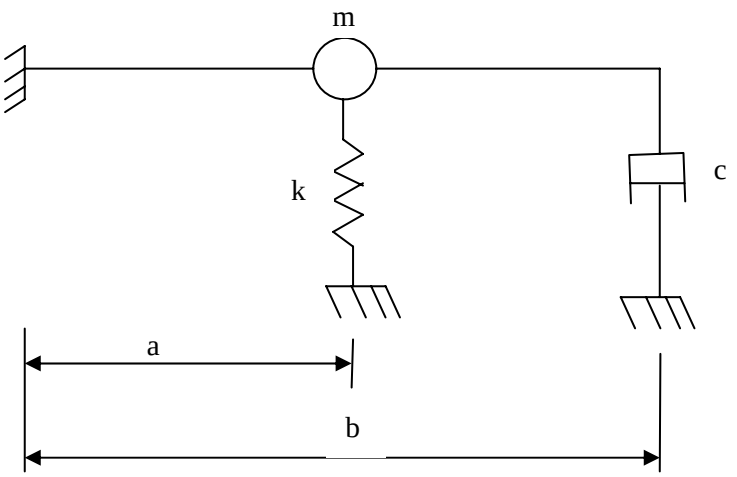

Figure 2