Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 710902N **Date: 07/07/2012**

Subject Name: Dynamics of Machinery

Time: 2:30 pm – 05:00 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 do you mean by vibration isolation and force transmissibility? **07**

(b) A single cylinder vertical petrol engine of total mass 400 kg is mounted upon a steel chassis and causes a vertical static deflection of 0.002 m. The reciprocating parts of the engine have a mass of 25 kg and move through a vertical stroke of 160 mm with SHM. A dashpot with damping coefficient 1650 N-s/m is provided with the system. Determine the speed of the driving shaft at which the resonance will occur and the amplitude of steady state vibrations when driving shaft of the engine runs at 600 rpm. **07**

Q.2 **(a)** Find the natural frequency of the longitudinal vibrations of the system shown in Figure 1 by using Matrix method. **07**

(b) Derive an equation of motion of the transverse vibration of a continuous beam of uniform cross section carrying a uniformly distributed mass with usual notations. **07**

OR

(b) Explain about the classical and approximate methods of vibration analysis. **07**

Q.3 **(a)** Discuss about the mathematical model of the cam and follower system considering their elasticity. **07**

(b) What is the difference between expressions of jump speed in case of rigid cam and elastic cam? – explain briefly. **07**

OR

Q.3 **(a)** What do you mean by Automatic Control System? Explain with example: proportional control, integral control and derivative control action. **07**

(b) What do you mean by stability of the control system? Explain any one of the stability criteria in case of the control system. **07**

Q.4 **(a)** State the difference between the open loop and close loop control system on the base of definition, examples, advantages and limitations. **07**

(b) The characteristic equation of a control system is: **07**

$D^6 + 2D^5 + 8D^4 + 12D^3 + 20D^2 + 16D + 16 = 0$.

Investigate the stability condition for the system by using Routh criterion.

OR

Q.4 **(a)** Show that it is possible to express the solution for the wave equation $\frac{\partial^2 y}{\partial t^2} = \frac{T}{\rho}\left(\frac{\partial^2 y}{\partial x^2}\right)$ by the traveling wave equation $y = f_1(x - at) + f_2(x + at)$ **07**

where f_1 and f_2 are arbitrary functions, $a^2 = \frac{T}{\rho}$, T is the tension in the string, ρ is the mass per unit length of the string, y is the deflection of the string and x is the coordinate along the longitudinal axis of the string.

	(b)	State the common techniques used for noise and vibration control.	**07**
Q.5	**(a)**	State and justify the assumptions made for the governing equation of acoustic sound wave. What are the major considerations made for deriving the equation?	**07**
	(b)	State the various methods used for noise measurement. Explain any one of them.	**07**

OR

Q.5	**(a)**	Explain the Johnson's numerical analysis method used for cam-follower system.	**07**
	(b)	With neat sketch, explain the phase plane method for analysis of the jump phenomenon in case of cam-follower system.	**07**

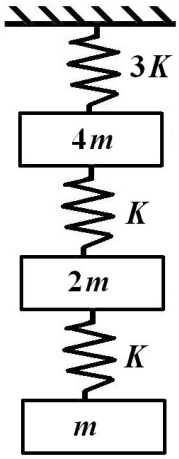

Fig 1, Q.2(a)

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