Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: 160103 Date: 23-05-2014

Subject Name: Vibration and Noise Control

Time: 10:30 am - 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? Also prove that in case of Coulomb damping amplitude reduces by 4F/k in one complete cycle. **07**

(b) Define and explain Continuous systems. Derive equations for vibration of strings. **07**

Q.2 **(a)** 1. Explain Beats phenomenon in detail. **04**

2. A body is subjected to two harmonic motions x_1=3sin40t and x_2= 4sin41t. What is the maximum and minimum amplitude of combined motion and what is the beat frequency. **03**

(b) A spring mass system having k_1 and m_1 has a natural frequency f_1. Calculate the value of k_2, another spring which when connected to k_1 in parallel increases the frequency by 30%. **07**

OR

(b) An unknown mass ‘m’ is attached to one end of a spring of stiffness k having natural frequency of 6 Hz. When 1 kg mass is attached with ‘m’ natural frequency of the system is lowered by 20%. Determine the value of unknown mass m and stiffness k. **07**

Q.3 **(a)** Explain lateral vibrations of a string and torsional vibrations of a shaft in detail with relevant sketches **07**

(b) In a single degree damped vibrating system a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine, **07**

(i) The stiffness of the spring (iii) Damping Factor

(ii) Logarithmic decrement (iv) The damping co-efficient

OR

Q.3 **(a)** Derive the solution of equation of motion for spring-mass-damping system and prove that under damped system is having a periodic motion. **07**

(b) A machine mounted on springs and fitted with a dashpot has a mass of 60kg. There are three springs each of stiffness 12N/mm. The amplitude of damping force varies as the velocity. Determine **07**

(i) The damping co-efficient

(ii) The ratio of frequencies of damped and undamped vibrations

(iii)The periodic time of damped vibrations.

Q.4 **(a)** Write a short note about accelerometers and frequency measuring instruments. **07**

(b) A machine part having a mass of 2.5kg vibrates in a viscous medium. a harmonic exciting force of 30N acts on the part and causes resonant amplitude of 14mm with a period of 0.22 seconds. Find the damping co-efficient. **07**

If the frequency of exciting force is changed to 4Hz determine the increase in the amplitude of the forced vibrations upon the removal of the damper.

OR

Q.4 **(a)** Explain Vibration isolation and Transmissibility. Derive expression for force transmissibility for a spring mass system. **07**

(b) The mass of vibrating system is 50kg. At a speed of 500 rpm the system and eccentric mass have a phase difference of 90 degrees and the corresponding amplitude is 2.5cm. The eccentric unbalanced mass of 2kg has a radius of rotation of 8cm. Determine **07**

(i) Natural frequency
(ii) The damping factor
(iii)The amplitude at 750 rpm
(iv)The phase angle at 750 rpm

Q.5 **(a)** Write the equations of motion for two rotor system and find natural frequencies. Also show that **07**

(i) Ratio of angular displacements is '1' for ω_1
(ii) Ratio of angular displacements is 'inversely proportional' to their moment of inertia for ω_2

(b) Explain basics of Vibration absorbers with example. What is the difference between vibration absorber and vibration isolator. **07**

OR

Q.5 **(a)** Use Lagrange's equation to find equation of motions for the system shown in Figure (1). **07**

(b) (i) Explain torsionally equivalent shaft. **04**

(ii) Write the equations of motion for the system shown in Figure (2) by Newton's 2nd law. Also put them into a matrix form. **03**

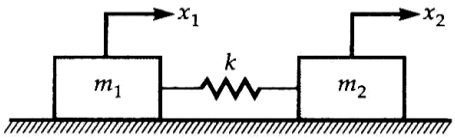

Figure (1)

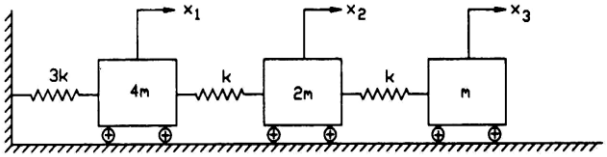

Figure (2)

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