Seat No.:_____ **Enrolment No. _____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEMESTER VI. EXAMINATION – SUMMER 2015

Subject code: 160103 **Date:08/05/2015**

Subject Name: Vibration and Noise control

Time:10.30AM-01.00PM **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)** Explain the following terms of vibration: **07**

(i) Free and forced vibration
(ii) Linear and non-linear vibration
(iii) Deterministic and random vibration
(iv) Longitudinal, transverse and torsional vibration
(v) Transient vibration
(vi) Damped and undamped vibration
(vii) Resonance

(b) Show that for finding the 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**

Q-2 **(a)** With help of neat sketch explain beat phenomenon **07**

(b) A cylinder of mass *M* and radius *r* rolls without slipping on a cylindrical surface of radius *R*. Find the natural frequency for small oscillations about the lowest point. **07**

OR

(b) Determine the natural frequency of the system shown in Fig. 1. **07**

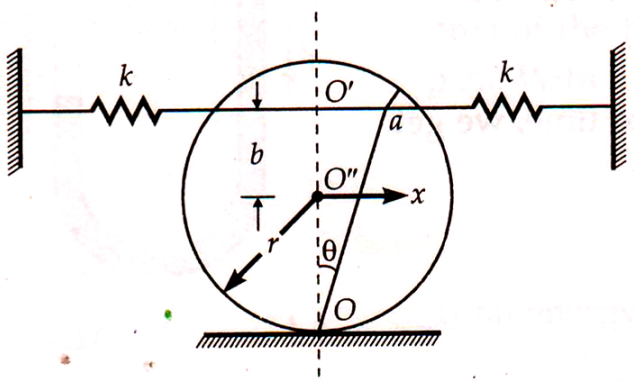

Fig. – 1.

Q-3 **(a)** Explain about viscous damping and coulomb damping. **07**

(b) A 80 kg machine is mounted on springs of stiffness k = 12 x 10^5 N/m with an assumed damping factor of 0.22. A 2.5 kg piston within the machine has a reciprocating motion with a stroke of 0.08 m and speed 3100 c.p.m Assuming the motion of the piston to be harmonic, determine the amplitude of vibration of **07**

the machine and the vibratory force transmitted to the foundation.

OR

Q-3 **(a)** Explain about structural damping and slip/interfacial damping. **07**

(b) A machine of mass one tonne is acted upon by an external force of 2500 N at a frequency of 1500 rpm. To reduce the effects of vibration, isolator of rubber having a static deflection of 2 mm under the machine load and an estimated damping factor 0.2 are used. Determine (1) the force transmitted to the foundation, (2) the amplitude of vibration of machine, and (3) the phase lag. **07**

Q-4 **(a)** An airfoil wing in its first bending and torsional modes can be represented schematically as shown in Fig. 2. connected through a translational spring of stiffness k and a torsional spring of stiffness kT. Write the equation of motion for the system and obtain the two natural frequencies. Assume the following data: $m = 7\ kg$, $I = 0.15\ kg\ m^2$, $k = 5 \times 10^3\ N/m$, $k_T = 0.4 \times 10^3\ Nm/rad$, $a = 0.1\ m$ **07**

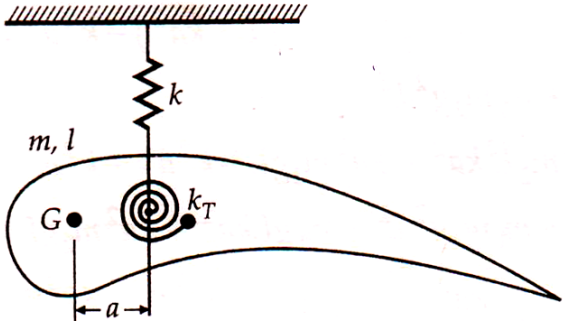

Fig. – 2.

(b) Explain operational principle and working of Vibrometer. **07**

OR

Q-4 **(a)** Three rail bogies are connected by two springs of stiffness 45×10^5 N / m each. The mass of each bogey is 22×10^3 kg. Determine the frequencies of vibration. Neglect friction between the wheels and rails. (Fig. 3) **07**

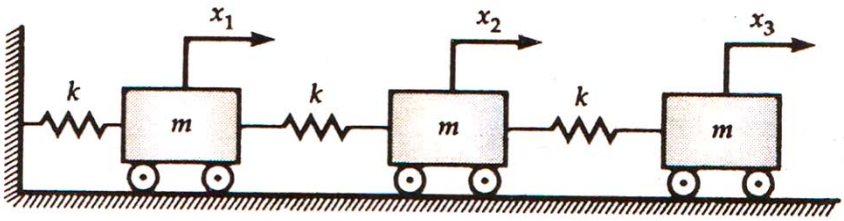

Fig. – 3.

(b) Explain operational principle and working of Accelerometer. **07**

Q-5 **(a)** Derive the equation of frequency for combined rectilinear and angular modes. **07**

(b) A body of 7 kg is supported on a spring of stiffness 280 N/m and has dashpot connected to it which produces a resistance of 0.002 N at a velocity of 0.1 mm/s. In what ratio will the amplitude of vibration be reduced after 5 cycles? **07**

OR

Q-5 **(a)** With help of neat sketch explain the beat phenomenon **07**

(b) What is influence co-efficient? And explain the Maxwell's theorem. **07**

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