

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – WINTER • 2014

Subject Code: 160103**Date: 01-12-2014****Subject Name: Vibration and Noise Control****Time: 02:30 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) Explain main causes of vibrations. How vibrations can be controlled or eliminated? Write applications where vibration is essential. **07**
- (b) Determine the effect of the mass of the spring on the natural frequency of the spring mass system. **07**
- Q.2** (a) Using Energy method derive differential equation of motion for un-damped free vibrations of single degree of freedom system **07**
- (b) Derive the equation of motion for Torsional vibrations of circular members. **07**
- OR**
- (b) Derive expression for frequency of compound pendulum.
- Q.3** (a) Starting from fundamentals prove that under-damped system is having a periodic motion. **07**
- (b) A machine of mass 60kg is placed on four springs. The mass of reciprocating parts is 3kg which moves through a stroke of 100mm. The speed of crank is 800rpm. The damping is introduced to reduce the amplitudes of successive vibrations by 20%. Find (I) The stiffness of each spring if damper is removed and the force transmitted to the foundation is $(1/10)^{\text{th}}$ of the impressed forced and (II) The forced transmitted to the foundation at 800rpm. **07**
- OR**
- Q.3** (a) Starting from fundamentals prove that critically damped system is having non-periodic motion. **07**
- (b) A vibrating system is defined by the following parameters: $M=3$ kg, $k=100$ N/m, $C = 3$ Ns/m. Determine: (a) The damping factor, (b) The natural frequency of vibration, (c) Logarithmic decrement, (d) The ratio of two consecutive amplitude, and (e) The number of cycles after which the original amplitude is reduced to 20 percent. **07**
- Q.4** (a) Explain in brief two nodes vibration of three rotor system. How it is differentiated from single node vibration? **07**
- (b) Explain with schematic diagrams working of Vibrometers, Tachometers and Accelerometers. **07**
- OR**
- Q.4** (a) What is transient vibration and steady state vibration in case of force damped vibration? Explain the salient features of frequency response curves. **07**
- (b) Determine the longitudinal vibrations of a uniform bar of length L , subjected to a sinusoidal force $F \sin \omega t$ at the free end. Assume one end is fixed. **07**
- Q.5** (a) Draw a neat diagram of frequency ratio verses transmissibility and explain the three salient regions for the practical application. **07**

- (b) Between a solid mass of 12 kg and the floor, two slabs of isolators, natural rubber and felt are kept in series. The natural rubber slab has a stiffness of 3200 N/m and an equivalent viscous damping coefficient of 110 N-s/m. The felt slab has a stiffness of 12,800 N/m and an equivalent viscous damping coefficient of 330 N-s/m. Determine the undamped and the damped natural frequencies of the system in vertical direction. Neglect the mass of the isolators. **07**

OR

- Q.5** (a) What do you mean by vibration isolation and force transmissibility? For a damped spring mass system derive expression for force transmissibility. **07**
- (b) A shaft 40 mm diameter and 2.5 m long has a mass of 1.5 kg per meter length. It is simply supported at the ends and carries three masses 90 kg, 140 kg and 60 kg at 0.8 m, 1.5 m and 2 m respectively from the left support. Taking $E = 200 \text{ GN/m}^2$, find the frequency of the transverse vibrations. **07**
