

GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem-VI Examination May 2011****Subject code: 160103****Subject Name: Vibration and Noise Control****Date: 19/05/2011****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) Explain main causes of vibrations. How vibrations can be controlled or eliminated? Write applications where vibration is essential. **07**
- (b) Define following terms: **07**
- (i) Periodic motion (ii) Time Period
 - (iii) Frequency (iv) Amplitude
 - (v) Simple Harmonic Motion (vi) Free Vibrations
 - (vii) Forced Vibrations

- Q-2** (a) With help of neat sketch explain about beat phenomenon. **07**
- (b) Derive expression for frequency of compound pendulum. **07**

OR

- (b) Determine the effect of the mass of the spring on the natural frequency of the spring mass system. **07**

- Q-3** (a) Using Energy method derive differential equation of motion for undamped free vibrations of single degree of freedom system **07**
- (b) A stepped shaft has three segments of diameters and lengths as follows: **07**
- $d_1 = 50 \text{ mm}$, $L_1 = 0.4 \text{ m}$
 $d_2 = 60 \text{ mm}$, $L_2 = 0.5 \text{ m}$
 $d_3 = 90 \text{ mm}$, $L_3 = 0.6 \text{ m}$.
- Find the equivalent length of shaft of uniform diameter of 60 mm. Hence find the natural frequency of Torsional vibration if $G = 0.83 \times 10^{11} \text{ N / m}^2$ and the mass moment of inertia of rotor is 15 kg-m^2 .

OR

- Q-3** (a) A vertical helical spring of length L , and stiffness k has both ends securely fixed. A mass m is attached to the spring at a distance s from one end. Determine the natural frequency of small longitudinal vibrations. Show that at $s = 0.5L$, frequency is minimum and hence find this frequency. **07**
- (b) Starting from fundamentals prove that critically damped system is having non-periodic motion and under-damped system is having a periodic motion. **07**

- Q-4** (a) Explain about different types of damping. **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-4** (a) Determine the longitudinal vibrations of a uniform bar of length L , subjected to a sinusoidal force $F_o \sin \omega t$ at the free end. Assume one end is fixed. **07**
(b) Derive the equation of motion for Torsional vibrations of circular members. **07**
- Q-5** (a) Explain about Torsional absorber and Dry friction absorber. **07**
(b) For undamped two degree of freedom free vibration system derive expressions for the principal modes of vibration. **07**
- OR
- Q-5** (a) Explain about Vibrometers and accelerometers. **07**
(b) What do you mean by vibration isolation and force transmissibility? For a damped spring mass system derive expression for force transmissibility. **07**
