

06/05/2016

6E7014

Roll No. _____

Total No of Pages: 4

6E7014

B. Tech. VI-Sem. (Main & Back) Exam., April/May-2016
Mechanical Engineering
6ME4A Vibration Engineering

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL _____

2. NIL _____

UNIT-I

- Q.1 (a) Discuss various methods used in controlling industrial noise. [8]
(b) Explain term loudness. How does it vary with the frequency? How this variation is taken in account in the subjective assessment. [8]

OR

- Q.1 (a) What are the auditory and non – auditory effects of noise. [8]
(b) Derive an equation for finding out sound intensity at a distance r from the source of sound of known sound power level. [8]

[6E7014]

UNIT-II

- Q.2 (a) A 5 kg mass attached to the lower end of a spring, where upper end fixed, vibrates with a natural period of 0.45 sec. Determine the natural period when a 2.5 kg mass is attached to the midpoint of the same spring with upper and lower ends fixed. [8]
- (b) A shaft supported freely at the ends has a mass of 100 kg placed 25 cm from one end. Find the frequency of the natural transverse vibration if the length of the shaft is 75 cm, $E = 200 \text{ GN/M}^2$ and shaft diameter is 4 cm. [8]

OR

- Q.2 (a) What do you understand by under – damped system, over damped system and critically – damped system and its use? Explain. [3+3+4=10]
- (b) A vibratory system in a vehicle is to be designed with the following parameters:
 $K = 100 \text{ N/m}$, $c = 2 \text{ N – Sec/m}$, $m = 1 \text{ kg}$
Calculate the decrease of amplitude from its starting value after complete oscillations and (b) the frequency of oscillation. [6]

UNIT-III

- Q.3 (a) Derive an expression for amplitude and phase angle of vibrations because of a rotating unbalance. [8]
- (b) A vibrating system having mass 1 kg is suspended by a spring stiffness 1000 N/m and it is put to harmonic excitation of 10 N. Assuming viscous damping, determine. [8]
- (i) The resonant frequency
 - (ii) The phase angle at resonance
 - (iii) The amplitude at resonance
 - (iv) The frequency corresponding to the peak amplitude and Take $C = 40 \text{ N – Sec/m}$.

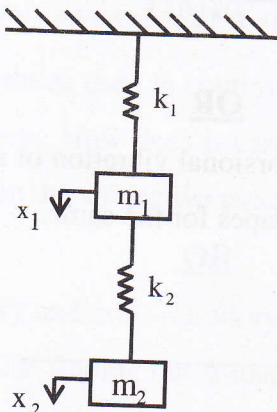
OR

Q.3 (a) An electric motor is supported on a spring and a dashpot. The spring has the stiffness 6400 N/m and the dashpot offers resistance of 500 N at 4.0 m/sec. The unbalanced mass 0.5 kg rotates at 5 cm radius and the total mass of vibratory system is 20 kg. The motor runs at 400 rpm. Determine:

- (i) Damping factor
 - (ii) Amplitude of vibration and phase angle
 - (iii) Resonant speed and resonant amplitude and
 - (iv) Forces exerted by the spring and dashpot on the motor. [2+3+3+2=10]
- (b) A spring mass damper system is subjected to a harmonic force. The amplitude is found to be 20 mm at resonance and 10 mm at a frequency 0.74 times the resonant frequency. Find the damping ratio of system. [6]

UNIT-IV

- Q.4 (a) Explain the principle of undamped dynamic vibration absorber. [8]
- (b) Figure shows a vibrating system having two degree of freedom. Determine the two natural frequencies of vibrations and the ratio of amplitudes of the motion of m_1 and m_2 for the two mode of vibration. [8]

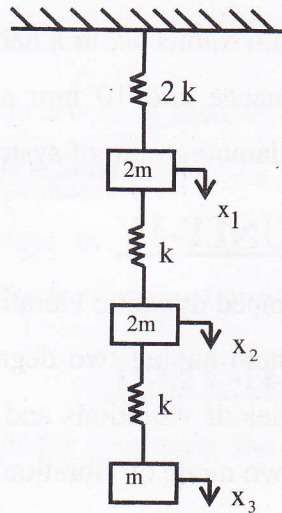


OR

- Q.4 (a) Explain principle & working of centrifugal pendulum absorber. [8]
- (b) A machine runs at 5000 rpm. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is to at least 20% from the forced frequency, design a suitable vibration absorber for the system. Assume the mass of the machine as 30 kg. [8]

UNIT-V

- Q.5 (a) Write short note on Stodola's Method. [8]
- (b) Using matrix method, Determine the natural frequencies of the system shown in figure. [8]



OR

- Q.5 Derive governing equation for the torsional vibration of a shaft fixed at both end. Find the frequency equation and mode shapes for the same. [16]
