6E3052

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6E3052

B. Tech. VI Semester (Main/Back) Examination, May/June - 2011

Mechanical Engineering

6ME4 Noise, Vibration and Harshness

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

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.)*

Unit - I

1. Write short note on the following :

   a) Decibel scale, addition and subtraction

   b) Frequency dependent human response to sound

   c) Octave band analysis

   d) Noise standards in India (4×4)

OR

   a) Explain the non auditory effects of noise on people (8)

   b) Explain the various methods used for noise control in Industrial environment. (8)

Unit - II

2. a) Write a note on compound pendulum and explain the importance of centre of percussion. (8)

   b) The natural frequency of a spring - mass system is found to be 2 Hz. When an additional mass of 1 kg is added to the original mass 'm', the natural frequency is reduced to 1 Hz. Find the spring constant 'k' and the mass 'm'. (8)

OR

a) Enlist the difference between a Viscous damped system and Coulamb damped system. **(8)**

b) A torsional pendulum has a natural frequency of 200 cycles/min when vibrating in a vacuum. The mass moment of inertia of the disc is 0.2 kg-m^2. It is then Immersed in oil and its natural frequency is found to be 180 cycles/min. Determine the damping constant. If the disc, when placed in oil, is given an initial displacement of 2^o, find its displacement at the end of the first cycle. **(8)**

Unit - III

3. a) Deduce the relationship for Force transmissibility of a single degree of freedom spring-mass-dashpot system subjected to a harmonic force. **(8)**

b) The peak amplitude of a single degree of freedom system, under a harmonic excitation, is observed to be 5 mm. If the undamped natural frequency of the system is 5 Hz, and the static deflection of the mass under the maximum force is 2.5 mm, estimate the damping ratio of the system and find the frequencies corresponding to the amplitudes at half power. **(8)**

OR

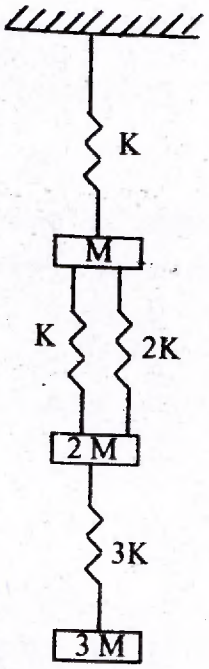
An automobile is modeled as a single degree of freedom system vibrating in the vertical direction. It is driven along a road whose elevation varies Sinusoidally. The distance from peak to through is 0.2 m and the distance along the road between the Peaks is 35 m. If the natural frequency of the automobile is 2 Hz and the damping ratio of the shock absorber is 0.15, determine the amplitude of vibration of the automobile at a speed of 60 km/Hr. If the speed of the automobile is varied, find the most un favourable speed for the passenger. **(16)**

Unit - IV

4. Write a detailed note on principle and working of undamped dynamic vibration absorber. Explain the term 'tuned absorber' and discuss the effect of mass ratio on the spread of frequency ratio. **(16)**

OR

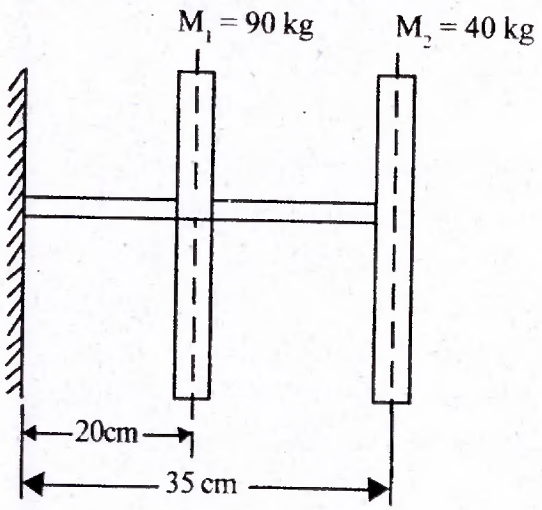
Find the frequency equation of the system shown in figure.



(16)

Unit - V

5. a) Find the natural frequency of vibration for the system shown in figure by the Dunkerley's method, neglecting the weight of the shaft. Take $E = 2\times10^{11}$ N/m^2 and $I = 3.5\times10^{-7}$ m^4.



(8)

b) Write a short note on Stodola's method. **(8)**

OR

Derive the governing equation of free longitudinal vibration of a uniform bar fixed at one end. Fixed the frequency equation and mode shaper for the same.**(16)**
