Exam.Code:0942
Sub. Code: 6732

2023
B.E. (Mechanical Engineering)
Sixth Semester
MEC-603: Mechanical Vibrations

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.***

x-x-x

1. (a) What is Logarithmic Decrement .

(b) Duhamel Integral is a method to solve .....vibration problems.

(c) What is Coulomb damping.

(d) What is Magnification factor.

(e) What are limitations of Torsional Vibration Absorber.

(f) What are natural boundary conditions.

(g) What is difference between Vibrometer and Accelerometer.

(h) What are Influence coefficients.

(i) What are longitudinal and Transverse Vibrations.

(j) Write Lagrange's Equation.

(10x1)

Part- A

2. (a) Show that two simple harmonic motions with frequency p and 2p when added will result in a periodic function of frequency p. Generalize the above for a number of harmonic functions with frequencies p, 2p.... np etc.

(b) A Harmonic motion has amplitude of 2 mm and the time period of 0.25 sec. Determine the maximum velocity and the acceleration.

(7, 3)

3. (a) A 200 kg machine is placed at the end of 1.8 m-long steel($E= 210 * 10^9 N/m^2$) cantilever beam. The machine is observed to vibrate with a natural frequency of 21 Hz. What is the moment of inertia of the beams cross section about its neutral axis.

(b)An under damped shock absorber is to be designed for an automobile. It is required that initial amplitude to be reduced to $1/16^{th}$ in one cycle. The mass of the automobile is 200 kg and damped period of vibration is 1 sec. Find necessary stiffness and damping constants of shock absorbers.

(5, 5)

P.T.O.

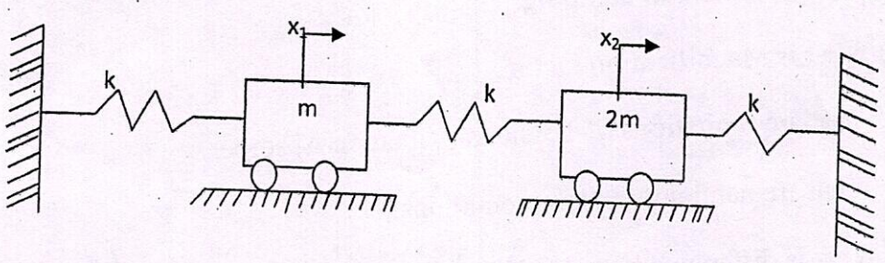
4. (a) What is Vibrometer. Briefly explain its principle and working with diagram.

(b) A 65 kg industrial sewing machine has a rotating unbalance of 0.15 kg-m. The machi operates at 125 Hz and is mounted on a foundation of equivalent stiffness 2 * 10^6 N/m a damping ratio 0.12. What is the machines steady state amplitude.

(5, 5)

Part- B

5. (a) Find the natural frequency and amplitude ratio of the system shown in Fig.



(b) A shaft of negligible weight 6 cm diameter and 5 meters long is simply supported at the ends and carries four weights 50 kg each at equal distance over the length of the shaft. Find the frequency of vibration by dunkerleys method. Take E = 2 * 10^6 kg/cm^2

(6, 4)

6. Determine the natural frequencies and mode shapes of torsional oscillation of a uniform shaft of length L, mass density ρ and cross- sectional polar moment of inertia J. The shaft is fixed at one end and free at other end.

(10)

7. Find the lowest natural frequency and modal vector of spring mass system having three degree of freedom having masses in the order 2m, 2m & m and stiffness 2k, k & k using matrix iteration method. Draw mode shape.

(10)

x-x-x