Roll No. ..... Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.–7 & 8th)
MECHANICAL VIBRATIONS
Subject Code : ME-408
Paper ID : [A0841]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY.**
2. **Attempt any FOUR questions from SECTION-B.**
3. **Attempt any TWO questions from SECTION-C.**

SECTION-A (10 × 2 = 20 Marks)

1. Write short notes on :

(a) Define degree of freedom of a vibratory system.

(b) What parameters are necessary so that the vibration may occur?

(c) How do you add two harmonic motions having different frequencies ?

(d) Define critical damping and its importance in vibrating system.

(e) In a spring mass system, if the mass of the system is doubled with spring stiffness halfed, the natural frequency of longitudinal vibrations will be ..... .

(f) What is orthogonality principle ?

(g) List of the different types of damping.

(h) What do you mean by torsionally equivalent shafts ?

(i) What is the difference between continuous and discrete systems ?

(j) Define the flexibility and stiffness influence co-efficients.

SECTION-B (4 × 5 = 20 Marks)

2. Add the following motions analytically.

$x_1 = 2 \cos (\omega t + 0{\cdot}5)$

$x_2 = 2 \sin (\omega t + 1{\cdot}0)$

3. A body of 5 kg is supported on a spring of stiffness 200 N/m and has a dashpot connected to it which produces a resistance of 0·002 N at a velocity of 1 cm/sec. In what ratio the amplitude of vibration be reduced after 5 seconds?

4. A diesel engine of a single cylinder has a mass of 500 kg and is mounted on mild steel chassis frame. The static deflection due to weight of chassis is 2·5 mm. The reciprocating masses of the engine amounts to 20 kg and the stroke of the engine is 180 mm. A dash pot with a damping co-efficient of 2000 *N.S/m* is also used to dampen the vibrations. In the steady state of vibrations, determine the amplitude of the vibrations if the driving shaft rotates at 400 r.p.m.

5. Explain the working principle of a centrifugal pendulum vibration absorber with the help of a neat sketch.

6. Derive the equation of motion of the system shown in fig. 1 and find its natural frequencies.

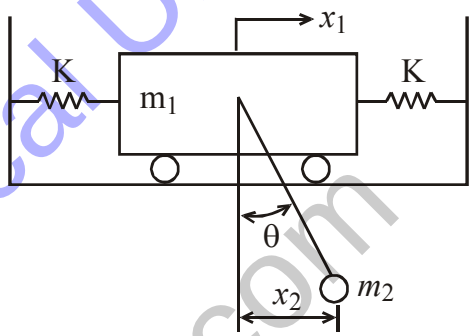

Fig. 1

SECTION-C **(2 × 10 = 20 Marks)**

7. Two pendulums of length L are shown in Fig. 2. Determine the natural frequency of each pendulum. If K = 100 N/m, m_1 = 2 kg, m_2 = 5 kg, L = 0·20 m & a = 0·10 m

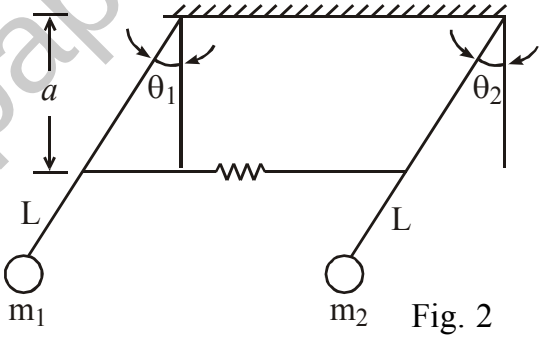

Fig. 2

8. A bar fixed at one end is pulled at the other end with a force P. The force is suddenly released. Investigate the vibrations of the bar.

9. Derive suitable expression for longitudinal vibrations for a rectangular uniform cross-sectional bar of length l fixed at one end and free it the other end.