

Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME)(Sem.-7,8)
MECHANICAL VIBRATIONS
Subject Code : BTME-803
M.Code : 71996
Date of Examination : 27-05-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Write short notes on following :

- a) What is the importance of the study of vibrations in engineering?
- b) Explain the concept of resonance.
- c) What are the three elementary parts of vibrating system?
- d) What is torsional vibration absorber?
- e) What is principal co-ordinate?
- f) What do you know about Lagrange's equation of motion for beam vibration?
- g) Differentiate between vibration absorber and vibration isolator.
- h) What do you know about critically damping system?
- i) What are longitudinal vibrations of bars?
- j) What is influence coefficient?

SECTION-B

- The rectilinear motion of a point is given by $\alpha = -9x$ where α and x are the acceleration and displacement of simple harmonic motion and the amplitude is 2 inches. Find (i) the period and frequency (ii) Displacement, velocity and acceleration after 21.5 seconds.
- Find the natural frequency of the system shown in the following figure.

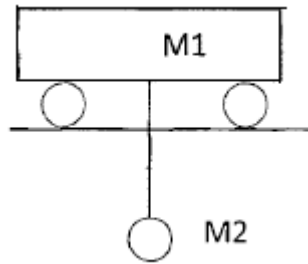


Fig.1

- Explain the working of torsional vibration absorber with neat sketch.
- Explain Dunkerley's method with suitable example used in multi-degree of freedom system.
- A bar of length L is fixed at one end and connected at the other end by a spring of stiffness ' K ' as shown in fig. Derive suitable expression of motion for longitudinal vibration.

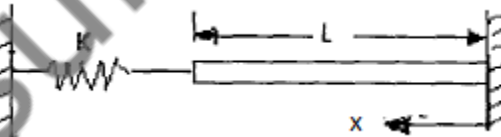


Fig.2

SECTION-C

- The exhaust from a single cylinder four stroke diesel engine is connected to a silencer and the pressure there in is to be measured with a simple U tube manometer. Calculate the minimum length of a manometer tube so that the natural frequency of the oscillation of the liquid column will be 3.5 times slower than the frequency of the pressure fluctuations in the silencer for an engine speed of 600 r.p.m.

8. 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 be at least 20% from the forced frequency, design a suitable vibration absorber for the system. Assume the mass of the machine as 30 kg.
9. Use Rayleigh's method to determine the natural frequency of spring mass system as shown in figure.

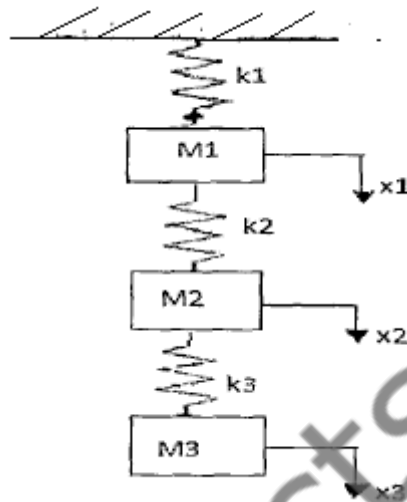


Fig.3

Assume $m_1 = m_2 = m_3 = m$ and $k_1 = k_2 = k_3 = k$

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.