

Roll No.

Total No. of Questions : 09

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B.Tech. (ME) (Sem.-7)
MECHANICAL VIBRATIONS

Subject Code : BTME-803

M.Code : 71996

Date of Examination : 30-04-2024

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. Answer briefly :

- a) The string length of simple pendulum is increased nine times, how the natural frequency of the system will be changed?
- b) What do you understand by resonance?
- c) Why it is important to find the natural frequency of a vibrating system?
- d) What are principal coordinates?
- e) Define the flexibility and stiffness influence coefficients.
- f) What is Rayleigh's principle?
- g) Define damping ratio and critical damping.
- h) What is difference between a vibration absorber and vibration isolator?
- i) What is an accelerometer?
- j) How many natural frequencies does a continuous system have?

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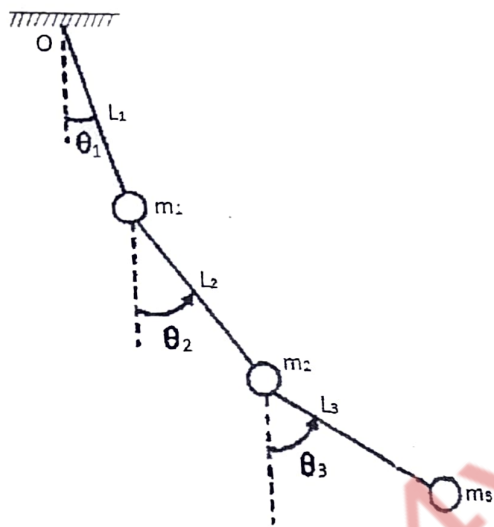
SECTION-B

2. A body describes simultaneously two motions $x_1 = 3 \sin 40t$, $x_2 = 4 \sin 41t$. What is the maximum and minimum amplitude of combined motion and beat frequency?
3. A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at the free end. The Young's modulus for the shaft is 200 GN/m^2 . Determine the frequency of longitudinal and transverse vibrations of the shaft.
4. In a vibrating system of mass of 3 kg vibrates in a viscous medium. A harmonic force of 30 N acts on the system and causes resonant amplitude of 15 mm with a period of 0.25 s. Find the damping coefficient.
5. In a spring mass system, the mass of 10 kg makes 40 oscillations in 20 s without damper. With damper, the amplitude decreases to 0.20 of the original value after 5 oscillations. **Find out:**
 - a) Stiffness of spring,
 - b) Logarithmic decrement,
 - c) Damping factor,
 - d) Damping coefficient.
6. Draw a neat sketch of dry friction damper and explain its working.

SECTION-C

7. Derive suitable expression for longitudinal vibrations for a rectangular uniform cross-sectional bar of length l fixed at one end free at the other end.
8. **Explain the following:**
 - a) Vibrometer
 - b) Holzer's method.

9. A triple pendulum oscillates as shown in Fig. below. For $L_1 = L_2 = L_3 = L$, determine the natural frequencies for the triple pendulum.



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.