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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME) (2012 Onwards) (Sem.-7,8)

**MECHANICAL VIBRATIONS**

Subject Code : BTME-803

M.Code : 71996

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**

**Q1. Answer briefly :**

- a) What are the main causes of vibration?
- b) Define Simple Harmonic Motion.
- c) State the different types of vibrations.
- d) Define normal mode of vibration.
- e) What is vibration isolation?
- f) Define transmissibility in a forced excitation system.
- g) State the number of degrees of freedom of a continuous system.
- h) A light cantilever of length 'L' has a mass 'M' fixed at its free end. What will be the frequency of lateral vibrations in the vertical plane?
- i) What do you mean by critically damped system?
- j) Define the term "influence coefficient".

## SECTION-B

- Q2. What are the principles on which a vibrometer and an accelerometer are based? Explain with a neat sketch.
- Q3. What is the Semi-Definite system? Derive an expression for determining the frequency of the system.
- Q4. A machine runs at 5000 rpm. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is at least 20% from the forced frequency, design a suitable vibration absorber for the system. Assume the mass of the machine as 30 kg.
- Q5. Determine the flexibility influence coefficient for the system as shown in fig. 1. Assume  $E=2.1 \times 10^{11} \text{ N/m}^2$ .

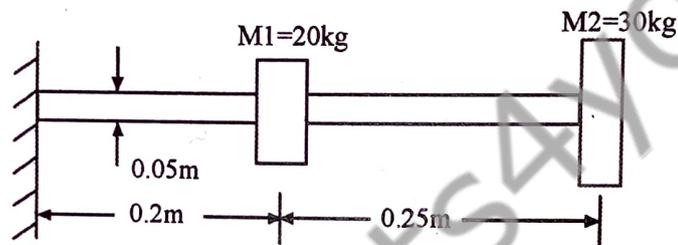


FIG.1

- Q6. 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. 2. Derive suitable expression of motion for longitudinal vibration.

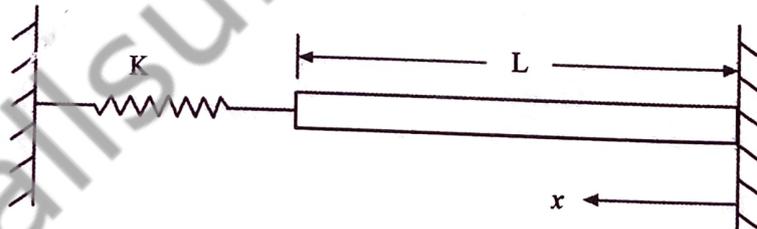


FIG.2

## SECTION-C

- Q7. Derive an expression for the response of single degree of freedom system with viscous damping when it is under damped.

- Q8. Write the limitations of dynamic vibration absorber. Prove that natural frequency of centrifugal pendulum absorber is always proportional to the speed of the rotating body.
- Q9. Use Stodola's method to determine the natural frequency of spring mass system as shown in fig. 3.

Assume  $m_1 = m_2 = m_3 = m$  and  $K_1 = K_2 = K_3 = K$

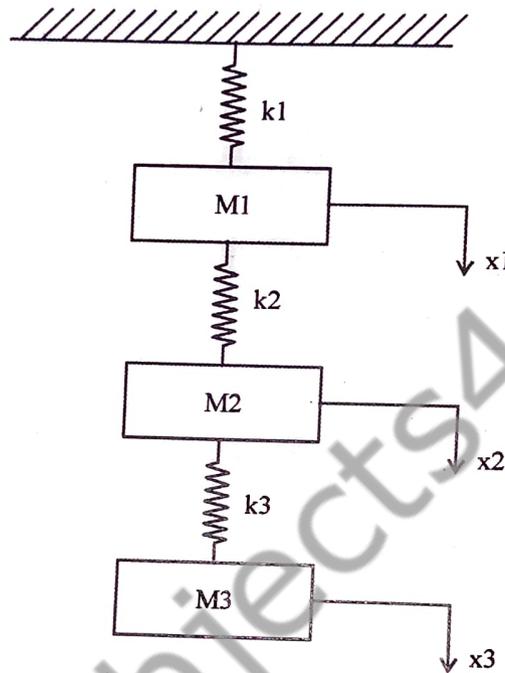


FIG.3

**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.**