

M.Tech. Mechanical Engineering Design (CBCS) Semester-I  
**MED13 - Mechanical Vibrations**

P. Pages : 2

Time : Three Hours

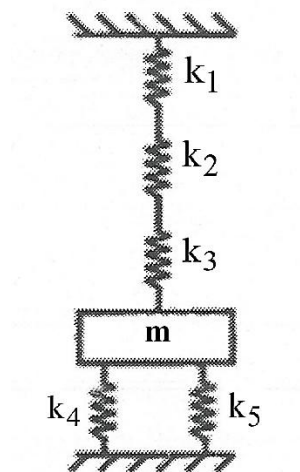


**GUG/S/25/14188**

Max. Marks : 70

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Diagrams and Chemical equation should be given wherever necessary.
  5. Illustrate your answers wherever necessary with the help of neat sketches.
  6. Answer **any five** questions.

1. a) Explain terms related to vibration 7
  - i) Force vibration.
  - ii) Free or natural vibration.
  - iii) Damped vibration.
  - iv) Longitudinal vibration.
- b) Explain in brief the continuous system of longitudinal vibration of Bars. 7
2. A cantilever shaft 50 mm diameter and 300mm long has a disc of mass 100kg at its free end. The young's modulus for the shaft material is  $200 \text{ an / m}^2$  determine the frequency of longitudinal and transverse vibrations of the shaft. 14
3. a) Explain vibration isolation for two plane symmetrical system and it's free body diagram. 7  
b) Write differential equations of motion in matrix form in terms of stiffness matrix. 7
4. For the system shown in figure below  $k_1 = 2000 \text{ N/m}$ ,  $k_2 = 1500 \text{ N/m}$ ,  $k_3 = 3000 \text{ N/m}$ ,  $k_4 = k_5 = 500 \text{ N/m}$  .Find out  $m$  such that the system has a natural frequency of 10 Hz. 14



5. a) What are principles on which a Vibrometer and an accelerometer are based? 7
- b) Derive an expression for vibration response of a single degree of freedom system if the damping provided is over damped system. 7
6. a) Give two examples of non-linear vibration explain. 7
- b) A damper offers resistance 0.05N at constant velocity of 0.04m/sec. The damper is used with  $k = 9\text{N/m}$ . Determine the damping and frequency of the system when the mass of the system is 0.1kg. 7
7. A bar fixed at one end is pulled at the other end with a force P. The force is suddenly released, investigate the vibration of bar. 14
8. a) What are the principles on which a Vibrometer and an accelerometer are based? 7
- b) Give two examples of non-linear vibration explain. 7

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