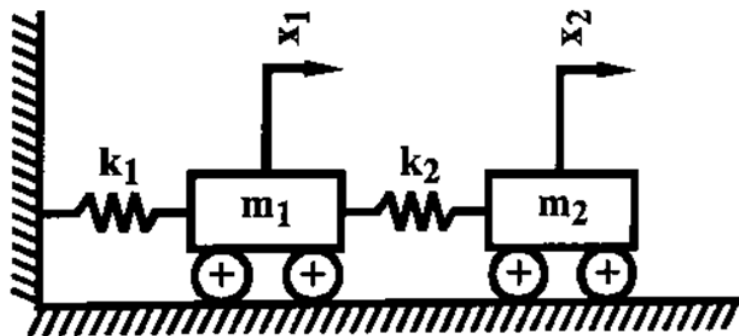




- Notes :
1. Assume suitable data wherever necessary.
 2. Illustrate your answers wherever necessary with the help of neat sketches.
 3. Drawing instruments, Design data books non programmable calculator is permitted.
 4. Answer **any five** questions.

1. a) Explain terms related to vibration a. Free vibration b. free a natural vibration. 7
 b) Derive an expression for vibration response of a single degree of freedom system if the damping provided is over damped system. 7
2. What do you mean by two degree of freedom system? Draw a two degree of freedom system and determine the two natural frequencies of that system. 14
3. a) Find the natural frequencies and first two normal mode shapes of the system shown in Fig. Assume $k_1 = k_2 = k$ and $m_1 = m_2 = m$. 7



- b) Derive an expression for vibration response of a single degree of freedom system if the damping provided is over damped system. 7
4. A vibrating system having mass 1 kg is suspended by a spring of stiffness 1000 N/m and it is put to harmonic excitation of 10N. Assuming viscous damping, determine: 14
 - i) The resonant frequency
 - ii) The phase angle at resonance
 - iii) The amplitude at resonance
 - iv) Damped frequency

5. a) What are principles on which a Vibrometer and an accelerometer are based? 7
- b) Write differential equations of motion in matrix form in terms of stiffness matrix. 7
6. a) Give two examples of non-linear vibration explain. 7
- b) Explain in brief the continuous system of longitudinal vibration of Bars. 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. Write short notes on following. 14
- a) Frequency response plot
- b) Analysis of vibration record
- c) Modal Analysis
- d) Vibration of strings
