

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: B.TECH.  
BRANCH: MECHANICAL

SEMESTER : V  
SESSION : MO/2022

SUBJECT: ME303 MECHANICAL VIBRATION

TIME: 3:00 Hours

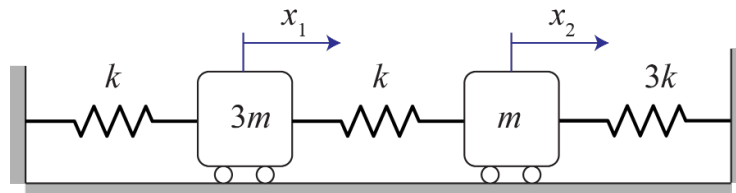
FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Explain energy method to find the natural frequency of a single degree of freedom system. [5] CO1 Understand
- Q.1(b) Derive the expression for the amplitude of vibration due to rotating unbalance. [5] CO1 Apply

- Q.2(a) Explain influence coefficients and flexibility matrix with an example. [5] CO2 Understand
- Q.2(b) Determine the natural frequencies of the system shown in Figure. [5] CO3 Evaluate



- Q.3(a) The flexibility and mass matrices of a vibrating system are [5] CO2 Evaluate
- $$[a] = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{bmatrix} \times 10^{-3} \text{ m/N and } M = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \text{ kg.}$$

Find the fundamental frequency using Dunkerley's method.

- Q.3(b) Explain matrix iteration method for a multi degree of freedom system. [5] CO3 Understand
- Q.4(a) Write the four boundary conditions for a simply supported beam. [5] CO4 Remember
- Q.4(b) Derive the equation of motion for longitudinal vibration of a bar. [5] CO4 Apply
- Q.5(a) Write short notes on signal analyzer. [5] CO5 Remember
- Q.5(b) Explain the working principle of an accelerometer. [5] CO5 Understand