

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TERM 3 EXAMINATIONS-2024

Ph.D. (Structural Engineering)- I Semester

COURSE CODE (CREDITS): 18P1WGE101 (3)

MAX. MARKS: 25

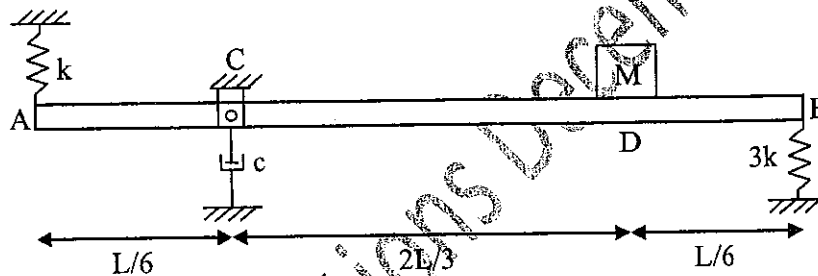
COURSE NAME: Research Methodologies Including Quantitative Methods & Computer Applications

COURSE INSTRUCTOR: Sugandha Singh

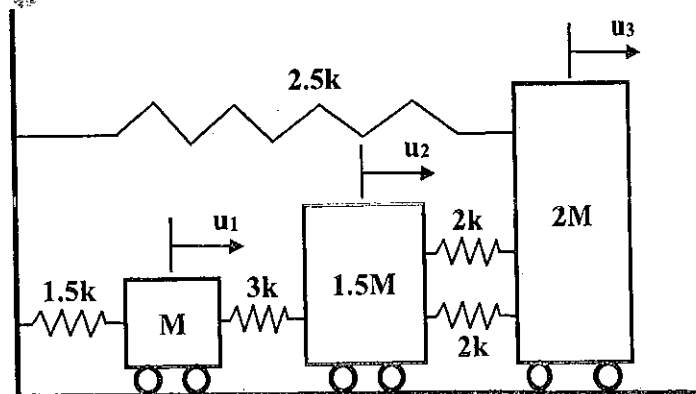
MAX. TIME: 1 Hour 30 minutes

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

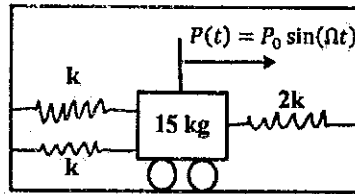
1. Write the equation of motion of the following systems in terms of vertical displacement, u , at point B. Assume that the mass per unit length is \bar{m} for the following beam. [7 marks]



2. What is the Dynamic Magnification Factor (DMF)? If a Single Degree of Freedom (SDOF) system, with stiffness, k , mass, m , damping constant, c , damping ratio, ξ , and natural frequency, ω , is subjected to harmonic ground displacement, $u_g(t) = u_{g0} \sin \Omega t$, derive the formula for DMF and plot the relationship between frequency ratio, β , and DMF. [5 marks]
3. For the MDOF system given below, assume, $M=100 \text{ kg}$ and $K=2000 \text{ N/m}$, find the following: [8 marks]
- Mass Matrix, Stiffness Matrix, and Equations of Motion. [3]
 - Modal Frequencies and Mode Shapes. [5]



4. The motion of block in a box is excited by $P(t) = 100 \sin(20\pi t)$. Develop the equation of motion for the block. For what range of stiffness, k will the amplitude of steady-state relative displacement of the block be less than 0.01 m? [5 marks]



Term 3 Examinations December 2024