Reg. No.															

Question Paper Code	13368

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024 (JAN - 2025)

First Semester

M.E. - CAD / CAM

24PCDPC104 - MECHANICAL VIBRATIONS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

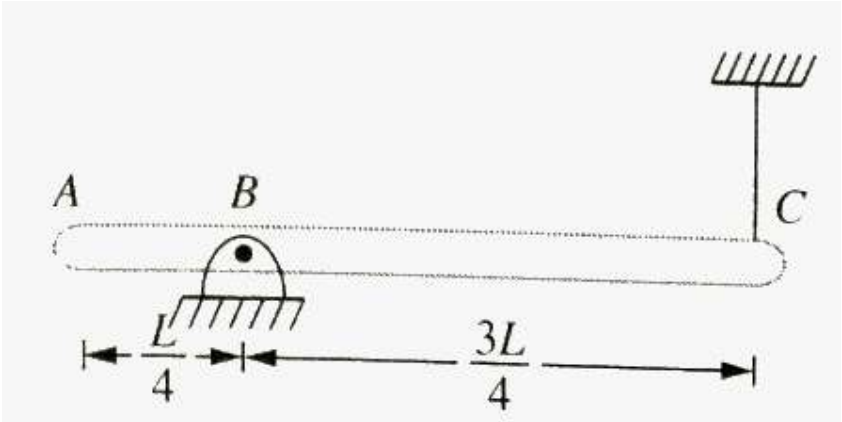
Answer ALL Questions

		Marks	K – Level	CO
1.	Define forced vibration.	2	K1	CO1
2.	What is the use of vibration?	2	K1	CO1
3.	Explain the various methods available for vibration control.	2	K2	CO2
4.	Define spring stiffness and state its unit.	2	K1	CO2
5.	Define Coordinate coupling.	2	K1	CO3
6.	What is meant by Normal mode of Vibration?	2	K1	CO3
7.	What is 'nth mode of vibration' in continuous system?	2	K1	CO4
8.	How many natural frequencies Continuous systems have?	2	K1	CO4
9.	List out the sensors used in vibration application.	2	K1	CO5
10.	What are parameters are measured in Vibration Measurement?	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

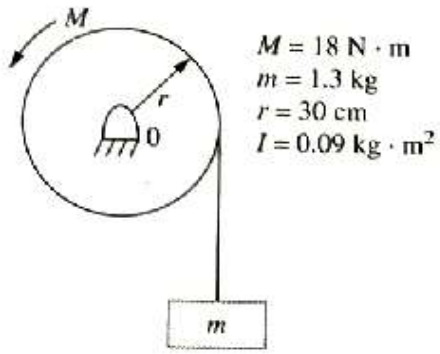
Answer ALL Questions

11.	a)	A slender rod (I = 1/12 mL2) AC of Fig below of mass m is pinned at B and hold horizontally by a cable at C. Determine the angular acceleration of the bar immediately after the cable is cut.	13	K3	CO1



OR

b) Determine the acceleration of the block shown in Fig below *13 K3 CO1*

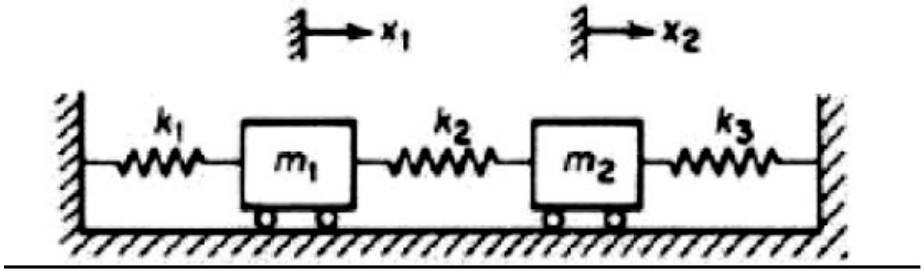


12. a) With a neat sketch, Describe the Active vibration isolation system and find the closed-loop equation. *13 K3 CO2*

OR

b) Considering Coordinate coupling method, Derive the Matrix equation for Damping matrix. *13 K3 CO2*

13. a) The following system shows the Three degree of freedom undamped system. Determine the first natural frequency of vibration, using Dunkerley's principle. Stiffness: $k_1=k_2=k_3=100$ N/m and mass : $m_1=m_2=m_3=10$ kg. *13 K3 CO3*



OR

b) Set up the equations of motion of the Double pendulum in terms of angles θ_1 and θ_2 from the vertical. *13 K3 CO3*

14. a) Derive the equation of Modal damping of n-DOF system, through Rayleigh damping. *13 K3 CO4*

OR

b) Determine the natural frequencies and mode shapes of a uniform thin slender rod having one end fixed and the other end free. *13 K3 CO4*

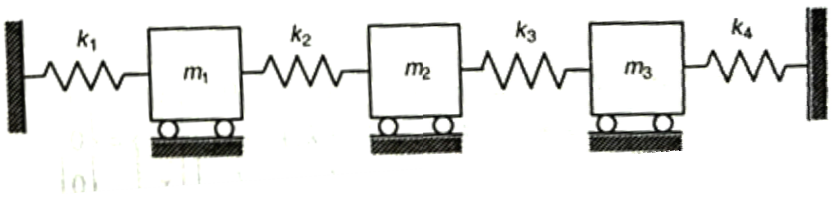
15. a) A Vibrometer having a natural frequency of 4 rad/s and is attached to a structure that performs a harmonic motion. If the difference between the maximum and the minimum recorded values is 8 mm, Determine the amplitude of motion of the vibrating structure when its frequency is 40 rad/s. *13 K3 CO5*

OR

b) An accelerometer has a suspended mass of 0.01 kg with a damped natural frequency of vibration of 150 Hz. When mounted on an engine undergoing an acceleration of 1g at an operating speed of 6000 rpm, the acceleration is recorded as by the instrument. Determine the damping constant and the spring stiffness of the accelerometer. *13 K3 CO5*

PART - C (1× 15 = 15 Marks)

16. a) For the three-degree system shown below *15 K3 CO3*
(a) Determine the stiffness and flexibility influence coefficient.
(b) Obtain the equations of motion for the system.



OR

b) A cable of length and length ' l ' and mass r per unit length is stretched under tension F. One end of the cable is connected to a pin, which can move in a frictionless slot and the other end is fixed. Determine the natural frequencies of vibration of the cable. *15 K3 CO3*