QP Code: R261B022 | Reg. No | | | | | | | | | | | AY 25

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (Second Semester - Regular) Examinations, May – 2026

24MSEPC12002 – Structural Dynamics

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Define periodic motion.	CO1	K2
b. Define vibration.	CO2	K2
c. Define structural damping.	CO3	K2
d. Define flexibility matrix.	CO4	K2
e. Name any two vibration measuring instruments.	CO5	K2

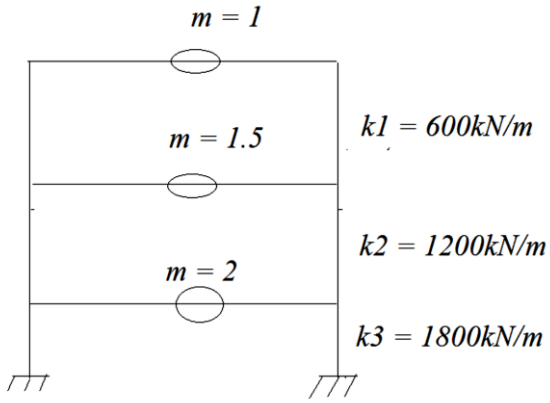
PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Differentiate between periodic motion and simple harmonic motion.	5	CO1	K2
b. Derive the equations governing forced harmonic vibration of multi degree of freedom systems.	5	CO1	K3
(OR)			
c. Explain in detail about the free and forced vibration of two degree of freedom systems.	10	CO1	K2
3.a. Explain the concept of natural frequency and discuss the factors affecting it.	5	CO2	K3
b. Derive the equation of motion for an undamped free vibration system.	5	CO2	K3
(OR)			
c. The Stiffness and mass matrices of a vibrating system is given below. Determine its fundamental frequency and Mode shapes. $[M] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2.5 \end{bmatrix}$ $[K] = \begin{bmatrix} 600 & -600 & 0 \\ -600 & 1800 & -1200 \\ 0 & -1200 & 3000 \end{bmatrix}$	10	CO2	K3
4.a. Explain arbitrary excitation in vibrating systems.	5	CO3	K2
b. Describe the use of Laplace transform formulation in vibration analysis.	5	CO3	K2
(OR)			
c. Determine the mode shapes and nodal frequencies of a three storey building by modal super position method. The storey masses are M1=360 kg, M2=250 kg, M3= 150kg and storey stiffness are K1= 3000kN/m, K2= 2000kN/m and K3=1000kN/m.	10	CO3	K2
5.a. Determine the natural frequencies of vibration of a uniform beam fixed at x=0 and simply supported at x=l.	10	CO4	K3

(OR)

b.	An SDOF system consists of a mass of 20kg, and a spring of stiffness 2200kN/m and dashpot with a damping coefficient of 60Ns/m and is subjected to a force of F = 200sin5t. Find its steady state response and peak amplitude. Find the maximum bending moment and shear force in the column if the column is infinitely rigid.	10	CO4	K3
6.a.	Explain random vibrations, time averaging and expected value in vibration analysis.	5	CO5	K3
b.	Explain Euler equation for beam vibration and discuss its significance.	5	CO5	K3

(OR)

c.	Determine the natural frequencies and mode shape for the shear building as shown in figure. 	10	CO5	K3

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