PVP 22

Code: 22MEMD1T3

I M.Tech - I Semester – Regular Examinations - MARCH - 2023

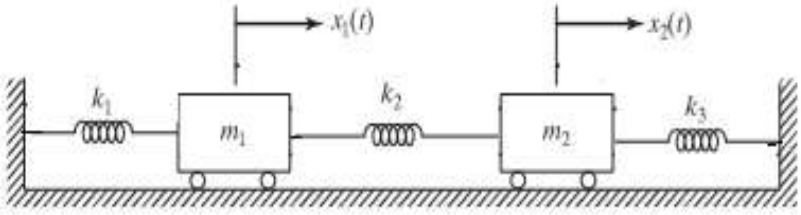
MECHANICAL VIBRATIONS
(MACHINE DESIGN)

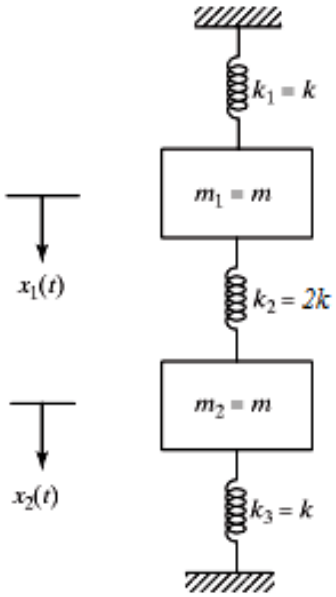
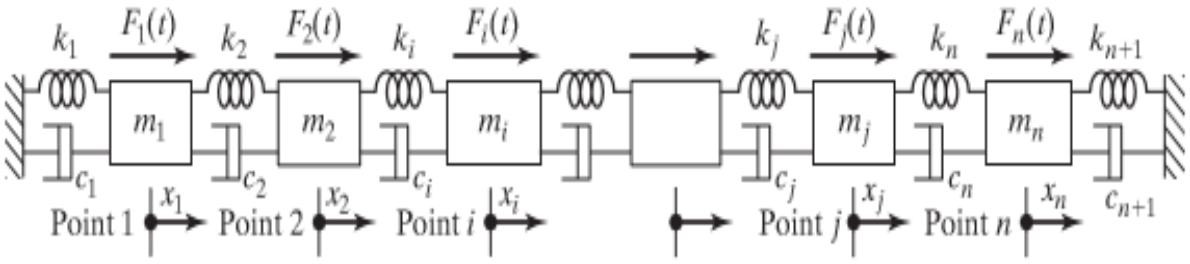
Duration: 3 hours Max. Marks: 60

Note: 1. This paper contains 4 questions from 4 units of Syllabus. Each unit carries 15 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	Derive the equation of motion of spring mass damped system if the damper is under the critical damped condition.	L3	CO1	8 M
	b)	The natural frequency of a single degree of freedom (1DoF) system is 20 rad/s, which drops to 19.6 rad/s upon adding a viscous dashpot. Determine the damping ratio.	L3	CO1	7 M
OR					
2	a)	Explain i) critical damping ii) phase angle iii) forced vibration iv)damped vibration	L2	CO1	8 M
	b)	State D Alembert's principle. Explain how the principle is employed in vibration problems?	L3	CO1	7 M

UNIT-II					
3	a)	Derive the response of an Undamped System Under Harmonic Force.	L3	CO2	5 M
	b)	A spring-mass system, with a spring stiffness of 5,000 N/m, is subjected to a harmonic force of magnitude 30 N and frequency 20 Hz. The mass is found to vibrate with an amplitude of 0.2 m. Determine the mass of the system by assuming vibration starts from rest.	L3	CO2	10 M
OR					
4	a)	Derive response of a Damped System Under Harmonic Force.	L3	CO2	7 M
	b)	Find the total response of a single-degree-freedom system with m=10kg, c=20 N-s/m, k=4000 N/m, x_0=0.01m and $\dot{x}_0$=0 under the following conditions: i) An external force $F(t)=F_0 \cos \omega t$ acts on the same system F_0=100 N and ω=10 rad/s. ii) Free vibration with F(t)=0	L3	CO2	8 M
UNIT-III					
5	a)	 Explain the free vibration analysis of the above mentioned system.	L3	CO3	10 M
	b)	Find the initial conditions that need to be applied to the system shown in Figure	L3	CO3	5 M

		below. So as to make it vibrate in (i) the first mode, and (ii) the second mode. 			
OR					
6	a)	Derive the equations of motion of the spring-mass-damper system shown in Figure below.	L3	CO3	10 M
					
	b)	Explain about influence coefficients of a multi degree of freedom system.	L2	CO3	5 M
UNIT-IV					
7	a)	Explain about machine condition monitoring and diagnosis.	L2	CO4	7 M
	b)	Explain condition based maintenance by taking example.	L2	CO4	8 M

		OR			
8	a)	Explain machine fault diagnosis by vibration analysis.	L2	CO4	8 M
	b)	Explain the types of condition monitoring.	L2	CO4	7 M