Exam. Code: 0942
Sub. Code: 6732

2054

B.E. (Mechanical Engineering)-Sixth Semester

MEC-603: Mechanical Vibrations

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: ***Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.***

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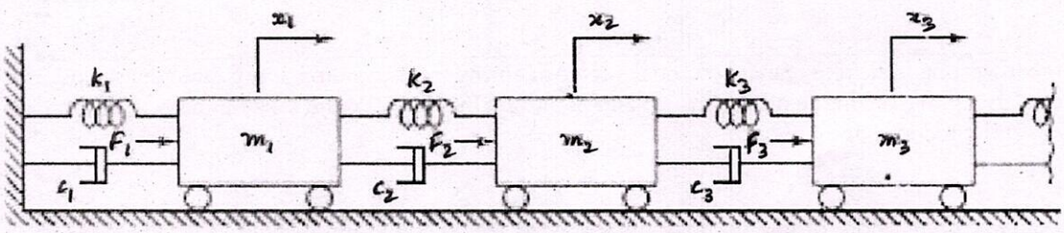
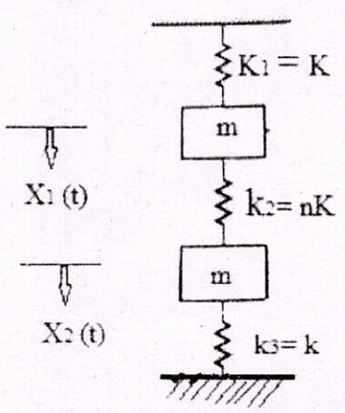
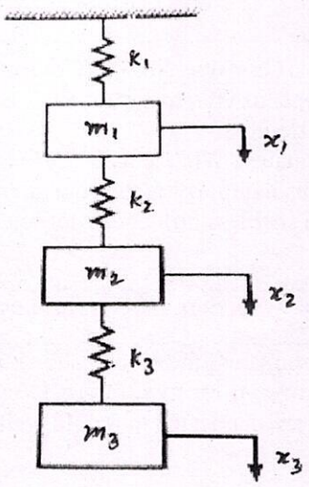
	Question No. - 1 (Compulsory Question)	
1	(a) Write the different elements of vibratory system. (b) How is transfer function defined? (c) What are principal coordinates? What is their use? (d) What is equivalent viscous damping? Is the equivalent viscous-damping factor a constant? (e) Define the flexibility and stiffness influence coefficients. What is the relation between them?	(5×2)
	Section A(Attempt any two questions)	
2	(a) Find the steady-state response of the system shown in Fig-1 with $K_1 = K_2 = K_3 = K_4 = 100$ N/m, $c_1 = c_2 = c_3 = c_4 = 1$ N-s/m, $m_1 = m_2 = m_3 = 1$ kg, $F_1(t) = F_0 \cos \omega t$, $F_0 = 10$ N, $\omega = 1$ rad/s. Assume that the spring K_4 and the damper c_4 are connected to a rigid wall at the right end. Use mechanical impedance method for solution.	7
	 Fig-1	
	(b) What assumptions are made in finding the natural frequency of a single-degree-of freedom system using the energy method?	3
3	(a) A vibratory body of mass 150kg, supported on springs of total stiffness 1050KN/m has a rotating unbalance force of 525N at a speed of 6000rpm.If the damping factor is 0.3, determine (i) the amplitude caused by the unbalance and its phase angle (ii) the transmissibility (iii) the actual force transmitted and its phase angle.	6
	(b) Write a short note on Motion transmissibility.	4
4	(a) Determine the principal coordinates for the spring-mass system shown in Fig-2.	6
	 Fig-2	
	(b) Explain inertia coupling with the help of suitable example.	4

<u>P.T.O.</u>

	Section B(Attempt any two questions)	
5	Using Rayleigh s method, determine the first natural frequency of vibration of the system shown in Fig-3. Assume K_1=K, k_2 =2K, k_3 = 3K and m_1= m, m_2= 2m, m_3 = 3m.  Fig-3	10
6.	Find the lowest natural frequency and modal vector of spring mass system having three degree of freedom having masses in the order 4m, 3m and m and stiffness 3k, 2k and k using matrix iteration method. Draw mode shape.	10
7	Drive suitable expression for longitudinal vibrations for a rectangular uniform cross-section bar of length L fixed at one end and free at the other end.	10

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