Hall Ticket Number:

Code No. : 16533 TS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

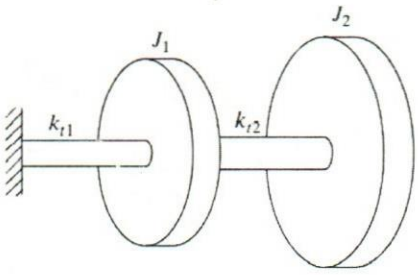
B.E. (Mech. Engg.) VI-Semester Main & Backlog Examinations, June-2022

SDC-IV: Technical Skills (Mechanical Vibrations)

Time: **2 hours** Max. Marks: **40**

*Note: Answer all questions from **Part-A** and any **THREE** from **Part-B***

Part-A (5× 2 = 10 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	What do you mean by logarithmic decrement factor and explainit'sphysical significance?	2	2	1	1
2.	What are principal coordinates andstatetheir use.	2	1	2	1
3.	Identify the role of eigen values and eigen vectorsin the study of mechanical vibrations.	2	1	3	1
4.	How many natural frequencies does a continuous system have and how does it differ from a discrete system in the nature of it's equation of motion.	2	1	4	1
5.	Listany twofrequency measuring Instruments and describe in brief the principle behind it.	2	1	5	1
	Part-B (3× 10 = 30 Marks)				
6. a)	List thevarious methods to obtain natural frequency of free vibration of a single degree of freedom spring-mass-system and discuss any one method in brief.	4	2	1	1
b)	A vibrating system consists of a mass of 50 kg, a spring with a stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine the i) damping factor ii) critical damping coefficient iii) natural frequency of damped vibrations iv) logarithmic decrement v) ratio of two consecutive amplitudes.	6	3	1	2
7. a)	Discuss about the static and dynamic coupling.	4	2	2	1
b)	Calculate the natural frequencies for the two-degree-of-freedom torsional system as shown in the figure below. Where J_1 , J_2represents the mass moments of inertia of the discs, k_{t1}, $k_{t2}$are the rotational spring constants Consider$k_{t2} = 2k_{t1}$and $J_2 = 2J_1$ 	6	4	2	2

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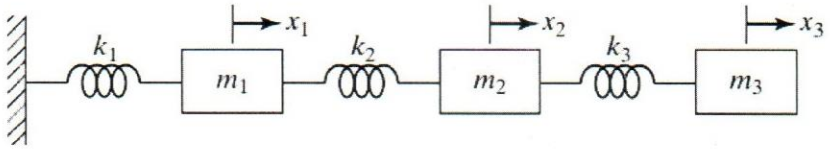
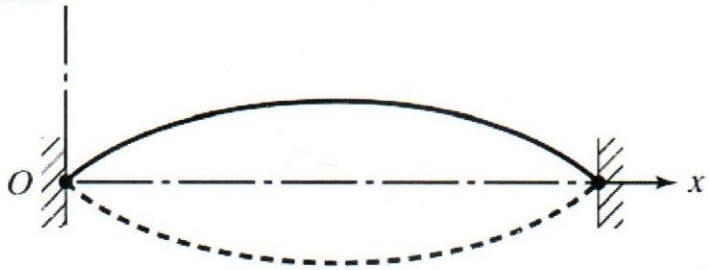
8.	a)	Discuss the procedure involved in diagonalization of mass and stiffness matrices.	4	2	3	1
	b)	The stiffness and mass matrices obtained by writing the governing equations of motion for three-mass linear system as shown in the figure below is given by  $[m] = \begin{bmatrix} m_1 & 0 & 0 \\ 0 & m_2 & 0 \\ 0 & 0 & m_3 \end{bmatrix}$, $[k] = \begin{bmatrix} k_1 + k_2 & -k_2 & 0 \\ -k_2 & k_2 + k_3 & -k_3 \\ 0 & -k_3 & k_3 \end{bmatrix}$, Compute the eigen values of the above system , considering $\mathbf{k_1 = k_2 = k_3 = k}$ and $\mathbf{m_1 = m_2 = m_3 = m}$	6	3	3	2
9.	a)	Write the boundary conditions of the beam for the following given end conditions of the beam. i) Free end ii) Simply supported (pinned) end iii) Fixed (clamped) end	4	1	4	1
	b)	Calculate the natural frequencies and also obtain the free-vibration solution of a string of length L and of uniform mass ρ per unit length , fixed at both ends as shown in the figure below , having transverse vibrations.  	6	4	4	2
10.	a)	Discussthe importance of vibration measurement and name the instrument used for measuring displacement, velocity and acceleration in a vibrating system.	4	2	5	1
	b)	List the various Vibration Exciters and explain in brief about anyone Vibration Exciter.	6	3	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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