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**BTECH**  
**(SEM V) THEORY EXAMINATION 2023-24**  
**MECHANICAL VIBRATIONS**

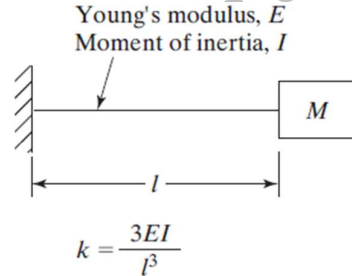
**TIME: 3 HRS****M.MARKS: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.**

Q no.	Question	Marks	CO
a.	What is mean by Frequency?	2	1
b.	What are the effects of vibration?	2	1
c.	Define damping.	2	1
d.	What is meant by Forced vibrations?	2	1
e.	Write a short note on simple Harmonic motion.	2	1
f.	Write short notes on D'Alembert's principle.	2	1
g.	Define Single Degree Freedom?	2	1
h.	Define Multi-degree Freedom system?	2	1
i.	Define Critical speed of shafts?	2	1
j.	Define Principle of vibration absorber?	2	1

**SECTION B****2. Attempt any three of the following:**

a.	Define Vibrations of systems with viscous damping?	10	2
b.	Define Harmonic excitation with viscous damping ? Also define steady state vibrations.	10	2
c.	Give Note on (i) Vibration isolators (ii) Vibration Dampers.	10	2
d.	Define Newton s Second Law to Derive Equations of Motion?	10	2
e.	Explain Undamped free and forced vibration of multi degree freedom?	10	2

**SECTION C****3. Attempt any one part of the following:**

a.	<p>A cantilever beam carries a mass <math>M</math> at the free end as shown in Fig. A mass <math>m</math> falls from a height <math>h</math> onto the mass <math>M</math> and adheres to it without rebounding. Determine the resulting transverse vibration of the beam.</p>  <p style="text-align: center;"><math>k = \frac{3EI}{l^3}</math></p>	10	3
b.	Explain the classifications of vibration with examples.	10	3

**4. Attempt any one part of the following:**

a.	A reciprocating pump, weighing 150 lb, is mounted at the middle of a steel plate of thickness 0.5 in., width 20 in., and length 100 in., clamped along two edges as shown in Fig. During operation of the pump, the plate is subjected to a harmonic force, $F(t) = 50 \cos 62.832t$ lb. Find the amplitude of vibration of the plate.	10	4
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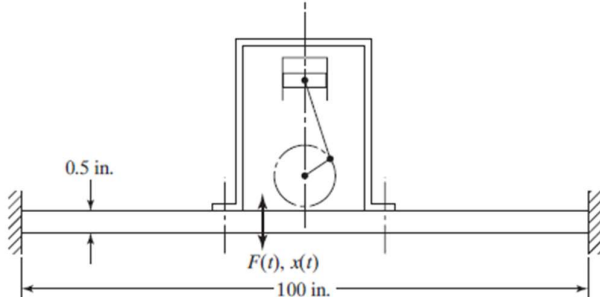
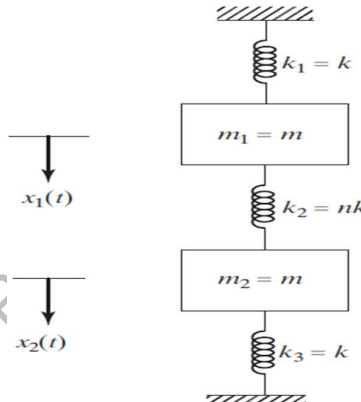
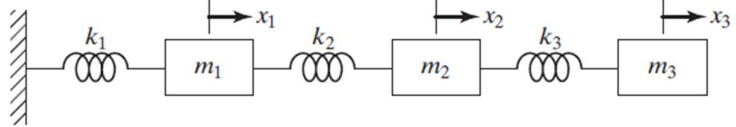
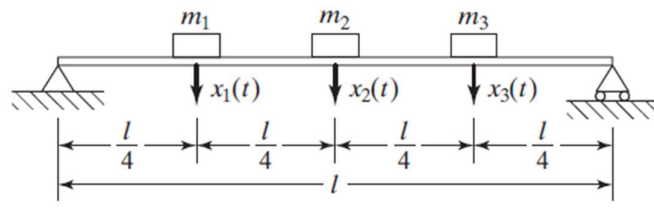
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TIME: 3 HRS

M.MARKS: 100

			
b.	Define Vibration measuring instruments with suitable sketch.	10	4
<b>5. Attempt any one part of the following:</b>			
a.	Find the natural frequencies and mode shapes of a spring-mass system, shown in Fig, which is constrained to move in the vertical direction only. Take $n=1$	10	5
			
b.	Define the Principle of vibration absorber? Also define Undamped Dynamic Vibration Absorber?	10	5
<b>6. Attempt any one part of the following:</b>			
a.	Find the stiffness influence coefficients of the system shown in Fig.	10	5
			
b.	Estimate the fundamental natural frequency of a simply supported beam carrying three identical equally spaced masses, as shown in Fig.	10	5
			
<b>7. Attempt any one part of the following:</b>			
a.	A shaft, carrying a rotor of weight 100 lb and eccentricity 0.1 in., rotates at 1200 rpm. Determine (a) the steady-state whirl amplitude and (b) the maximum whirl amplitude during start-up conditions of the system. Assume the stiffness of the shaft as $2 \times 10^5$ lb/in. and the external damping ratio as 0.1	10	6
b.	Define Secondary critical speed of shaft?	10	5