

Chapter 19

MECHANICAL VIBRATIONS

PROBLEM NO. 1

Determine the maximum velocity and maximum acceleration of a particle which moves in simple harmonic motion with an amplitude of 3 mm and a frequency of 20 Hz.

SOLUTION:

Frequency:

$$f = 20 \text{ Hz}$$

Amplitude:

$$\omega_n = 2\pi f = (2\pi)(20) = 125.66 \text{ rad/s}$$

$$x_m = 3 \text{ mm}$$

Simple harmonic motion:

$$x = x_m \sin(\omega_n t + \phi)$$

$$v = \dot{x} = \omega_n x_m \cos(\omega_n t + \phi)$$

Maximum Velocity:

$$v_m = \omega_n x_m = (125.66 \text{ rad/s})(3 \text{ mm})$$
$$= 377 \text{ mm/s}$$

$$\underline{v_m = 0.377 \text{ m/s}}$$

Maximum acceleration:

$$a_m = \omega_n^2 x_m = (125.66 \text{ rad/s})^2 (3 \text{ mm})$$
$$= 47.3 \times 10^3 \text{ mm/s}^2$$

$$\underline{a_m = 47.3 \text{ m/s}^2}$$

Mechanical Vibrations Study Guide

Carol Tear



Mechanical Vibrations Study Guide:

Mechanical Vibrations Study Guide Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has are more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Mechanical Vibrations Study Guide**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve into the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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