

1. What characterizes harmonic vibration in a mechanical system?

- a) Random oscillations
- b) Periodic oscillations
- c) Non-linear oscillations
- d) Continuous vibrations

Answer: b) Periodic oscillations

Explanation: Harmonic vibration refers to the periodic oscillation of a system around an equilibrium position. This motion repeats at regular intervals over time.

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2. In an undamped harmonic system, what happens to the amplitude of vibration over time?

- a) It decreases
- b) It increases
- c) It remains constant
- d) It oscillates randomly

Answer: c) It remains constant

Explanation: In an undamped harmonic system, there is no dissipation of energy, so the amplitude of vibration remains constant over time.

3. What role does damping play in a vibrational system?

- a) Increases the natural frequency
- b) Reduces the natural frequency
- c) Amplifies the amplitude
- d) Has no effect on the vibration

Answer: b) Reduces the natural frequency

Explanation: Damping in a system reduces the natural frequency, affecting the rate at which the system oscillates and the amplitude of vibration.

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4. Which term describes the measure of a system's resistance to oscillation?

- a) Damping ratio
- b) Natural frequency
- c) Amplitude
- d) Phase angle

Answer: a) Damping ratio

Explanation: Damping ratio quantifies the level of damping in a system, determining how

quickly oscillations decay.

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5. What is the significance of the natural frequency in a vibrational system?

- a) It determines the damping ratio
- b) It defines the amplitude of vibration
- c) It represents the frequency at which the system oscillates with minimum external force
- d) It indicates the phase shift

Answer: c) It represents the frequency at which the system oscillates with minimum external force

Explanation: The natural frequency is the frequency at which a system oscillates when no external force is applied, representing its inherent vibrational behavior.

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6. How does Fourier series representation aid in analyzing vibrations?

- a) It provides a graphical representation of vibrations
- b) It simplifies complex waveforms into simpler components
- c) It calculates damping ratios
- d) It measures the phase angle

Answer: b) It simplifies complex waveforms into simpler components

Explanation: Fourier series breaks down complex periodic functions into simpler trigonometric functions, facilitating analysis of vibration patterns.

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7. What is the primary purpose of vibration isolation systems?

- a) To amplify vibrations
- b) To reduce vibrations transmitted to surrounding structures
- c) To increase the natural frequency
- d) To introduce damping

Answer: b) To reduce vibrations transmitted to surrounding structures

Explanation: Vibration isolation systems are designed to minimize the transmission of vibrations from one system to another, thus preventing structural damage and disturbances.

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8. How does a periodic force affect the response of a vibrating system?

- a) It increases damping
- b) It decreases the natural frequency
- c) It induces resonance

d) It has no effect on vibration

Answer: c) It induces resonance

Explanation: A periodic force can lead to resonance in a vibrating system, causing significant amplification of vibrations if the force frequency matches the system's natural frequency.

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9. What does the Fourier series allow engineers to do in terms of system analysis?

- a) Predict the natural frequency
- b) Decompose complex vibrations into simpler components
- c) Calculate damping ratios
- d) Determine phase shifts

Answer: b) Decompose complex vibrations into simpler components

Explanation: Fourier series decomposition simplifies complex vibrations into a sum of simpler sinusoidal functions, aiding in the analysis of vibrational behavior.

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10. How does viscosity impact damping in a vibrational system?

- a) Increases damping

- b) Decreases damping
- c) Does not affect damping
- d) Randomizes damping

Answer: a) Increases damping

Explanation: Viscosity in a system increases damping by dissipating energy, thereby reducing the amplitude of vibrations over time.