1. What does the stiffness influence coefficient represent in a multi-degree-of-freedom system?

a) The amount of force required to displace the system by a unit amount
b) The contribution of each degree of freedom to the overall stiffness of the system
c) The ratio of displacement to applied force for a particular degree of freedom
d) The measure of damping in the system

Answer: b) The contribution of each degree of freedom to the overall stiffness of the system

Explanation: Stiffness influence coefficients represent how much each degree of freedom contributes to the overall stiffness of the system. It helps in understanding the distribution of stiffness throughout the system.

2. In the context of a multi-degree-of-freedom system, what does the flexibility influence coefficient indicate?

a) The inverse of stiffness influence coefficient
b) The damping coefficient of the system
c) The ability of the system to resist deformation
d) The measure of displacement for a unit force applied

Answer: a) The inverse of stiffness influence coefficient

Explanation: Flexibility influence coefficient is the inverse of stiffness influence coefficient. It represents how much a unit force applied at a particular degree of freedom causes displacement in that degree of freedom.

3. Which mathematical problem is solved to determine the natural frequencies and mode shapes of a multi-degree-of-freedom system?

a) Differential equation of motion
b) Matrix inversion
c) Eigenvalue problem
d) Fourier transform

Answer: c) Eigenvalue problem

Explanation: The natural frequencies and mode shapes of a multi-degree-of-freedom system are determined by solving the eigenvalue problem, where the characteristic equation is formed and solved to find the eigenvalues (natural frequencies) and corresponding eigenvectors (mode shapes).

4. What are normal modes in the context of multi-degree-of-freedom systems?

a) Modes of vibration that occur at high frequencies
b) Modes of vibration that occur at low frequencies
c) Vibration patterns where all degrees of freedom oscillate at the same frequency
d) Vibration patterns where each degree of freedom oscillates independently

Answer: c) Vibration patterns where all degrees of freedom oscillate at the same frequency

Explanation: Normal modes represent vibration patterns in a multi-degree-of-freedom system where all degrees of freedom oscillate at the same frequency. They are obtained through the solution of the eigenvalue problem.

5. What is the matrix iteration technique used for in the context of multi-degree-of-freedom systems?

a) Solving linear equations
b) Calculating damping coefficients
c) Determining natural frequencies and mode shapes
d) Analyzing system stability

Answer: c) Determining natural frequencies and mode shapes

Explanation: Matrix iteration technique is utilized to solve the eigenvalue problem, which determines the natural frequencies and mode shapes of a multi-degree-of-freedom system.

6. In modal analysis of a multi-degree-of-freedom system, what does the term “free vibration” refer to?

a) Vibration caused by external forces
b) Vibration in the absence of external forces
c) Vibration at resonant frequencies
d) Vibration with constant amplitude

Answer: b) Vibration in the absence of external forces

Explanation: Free vibration refers to the vibration of a system in the absence of external forces. It is characterized by the system oscillating according to its natural frequencies and mode shapes.

7. How are eigenvalues related to the natural frequencies of a multi-degree-of-freedom

system?

a) They are inversely proportional
b) They are directly proportional
c) They are logarithmically related
d) They are unrelated

Answer: b) They are directly proportional

Explanation: Eigenvalues obtained from solving the eigenvalue problem directly correspond to the natural frequencies of the multi-degree-of-freedom system. They are directly proportional to the square root of the stiffness of the system.

8. What property characterizes the orthogonality of mode shapes in a multi-degree-of-freedom system?

a) They have the same frequency
b) They have the same displacement
c) They have zero cross-correlation
d) They have identical shapes

Answer: c) They have zero cross-correlation

Explanation: Orthogonality of mode shapes in a multi-degree-of-freedom system means that the mode shapes are perpendicular to each other, indicating zero cross-correlation between them.

9. What is the significance of the stiffness influence coefficient in a multi-degree-of-freedom

system?

a) It indicates the system’s resistance to deformation
b) It determines the damping characteristics of the system
c) It represents the distribution of stiffness among degrees of freedom
d) It measures the system’s energy dissipation

Answer: c) It represents the distribution of stiffness among degrees of freedom

Explanation: Stiffness influence coefficients indicate how stiffness is distributed among different degrees of freedom in a multi-degree-of-freedom system, providing insight into the system’s structural behavior.

10. Which method is commonly used for analyzing forced vibrations in a multi-degree-of-freedom system?

a) Modal superposition
b) Fourier analysis
c) Direct integration
d) Power spectral density

Answer: a) Modal superposition

Explanation: Modal superposition is a common method used for analyzing forced vibrations in a multi-degree-of-freedom system. It involves expressing the response of the system as a linear combination of the modal responses excited by the applied forces.

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