



3. **Assertion (A):** For many practical cases, mathematical solution is not available and hence numerical procedure is adopted. CO2 [K<sub>2</sub>]  
**Reason (R):** In direct integration technique, time interval is divided into a discrete number of steps.
- a) Both A and R are Individually true but R is not the correct explanation of A      b) A is true but R is false
- c) A is false but R is true      d) Both A and R are Individually true and R is the correct explanation of A
4. The method which is on the principle that the acceleration varies linearly over an extended time is CO2 [K<sub>1</sub>]
- a) Wilson method      b) Finite difference method
- c) Range Kutta method      d) State response method
5. The ratio between the dynamic deflection and static deflection is called CO3 [K<sub>1</sub>]
- a) Dynamic factor      b) Deflection factor
- c) Dynamic load factor      d) Deflection ratio
6. When the frequency of the force and the frequency of the system matches, it results in CO3 [K<sub>1</sub>]
- a) Ductility      b) Resonance
- c) Stiffness      d) Oscillation
7. Prioritize the following in sequential order based on solution for an undamped MDOF system. CO4 [K<sub>2</sub>]
1. Eigen vector
  2. Eigen value
  3. Characteristic equation
  4. Equation of motion
- a) 1-2-3-4      b) 3-4-2-1
- c) 4-3-2-1      d) 2-3-4-1
8. The graphical representation of the relative amplitudes of the two coordinates and their phase angle relationship is called, CO4 [K<sub>1</sub>]
- a) Natural frequency      b) Mode shape
- c) Phase angle      d) Orthogonality

9. Which of the following statements is correct? CO5 [K<sub>2</sub>]
1. Vibratory pile drivers generate the minimum vibration levels during operation.
  2. The detonation of an explosive charge gives rise to a compression wave called a shock wave, which propagates through the air.
  3. A gust is a sudden increase of wind's speed that lasts for more than 20 seconds.
  4. Machine foundations should be designed such that the dynamic forces of machines are not transmitted to the soil
- a) 1, 2 b) 3, 4  
 c) 3, 4 d) 1, 4

10. Match list I with list II and select the correct answer using the codes given below. CO5 [K<sub>2</sub>]

List I	List II
A. Transverse oscillations	1. Owalling
B. Unstable oscillatory motion	2. Flutter
C. Periodic radial deformation	3. Galloping
D. Downward Oscillation	4. Buffeting

- a) 3 - 2 - 1 - 4 b) 1 - 2 - 3 - 4  
 c) 4 - 2 - 1 - 3 d) 2 - 4 - 1 - 3

**PART B (10 x 2 = 20 Marks)**

11. Compare periodic loads and non-periodic loads. CO1 [K<sub>2</sub>]
12. Compare free and forced vibration. CO1 [K<sub>2</sub>]
13. Outline the necessity of numerical methods. CO2 [K<sub>2</sub>]
14. Explain Direct Integration technique adopted in numerical methods. CO2 [K<sub>2</sub>]
15. Define damping ratio. CO3 [K<sub>2</sub>]
16. Explain harmonic loading. CO3 [K<sub>2</sub>]
17. State Orthogonality principle. CO4 [K<sub>2</sub>]
18. Define logarithmic decrement. CO4 [K<sub>2</sub>]
19. List the parameters which affect vibration characteristics. CO5 [K<sub>2</sub>]
20. List the types of machine foundation. CO5 [K<sub>2</sub>]

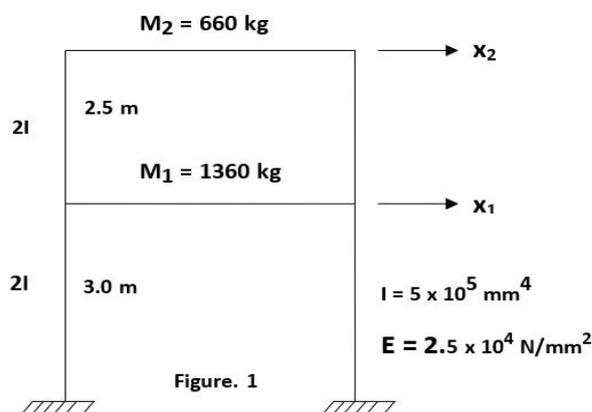
**PART C (6 x 5 = 30 Marks)**

21. What is damping. List and explain the types of damping. 5 CO1 [K<sub>2</sub>]
22. Explain Fourier analysis for periodic loading. 5 CO2 [K<sub>2</sub>]

23. What is Duhamel's integral? Derive the integral for an undamped system with a neat sketch. 5 CO3 [K<sub>3</sub>]
24. Outline the necessity of decoupling equations of motion. Explain Mode superposition method. 5 CO4 [K<sub>3</sub>]
25. Explain the three forms of wind induced oscillations on structures. 5 CO5 [K<sub>2</sub>]
26. Explain with an example the importance of idealization of structures to mathematical models. 5 CO1 [K<sub>2</sub>]

**Answer any FOUR Questions**  
**PART D (4 x 10 = 40 Marks)**

27. An oscillatory system with a natural frequency of 4Hz starts with initial amplitude of 1.5cm and an initial velocity of 15 cm/sec. Calculate all vibratory parameters involved and the time taken to reach the first peak. 10 CO1 [K<sub>2</sub>]
28. Explain Wilson method with a neat sketch. 10 CO2 [K<sub>2</sub>]
29. Derive the equations of motion for a SDOF system subjected to damped free vibration. Also discuss the solution for various types of damping. 10 CO3 [K<sub>3</sub>]
30. Determine the eigen values and eigen vectors for the shear building shown in Figure 1. 10 CO4 [K<sub>3</sub>]



31. What is base isolation? Explain the concept, types and advantages of base isolation with neat sketches. 10 CO5 [K<sub>2</sub>]

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