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Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(SE) (Sem.-1)  
**DYNAMICS OF STRUCTURES**  
Subject Code : CE-501  
Paper ID : [E0841]

Time : 3 Hrs.

Max. Marks : 100

**INSTRUCTIONS TO CANDIDATES :**

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.
3. Assume data, if not given.

1. a) Briefly discuss D'Alembert's Principle for formulation of equation of motion.  
b) A mass-spring system with viscous damping as shown in Fig 1 is displaced by an amount  $x_0$  from its static equilibrium position and released with zero initial velocity. Determine from basics, the ratio of any two consecutive amplitudes. (8 + 12)

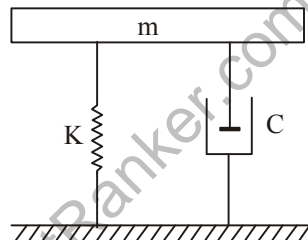


Figure - 1

2. a) What do you understand by Structural Damping? What is its significance?  
b) An object of mass 1000 kg is suspended from a spring system. The system was set into vibration and the frequency of the vibration was measured as 0.90 Hertz. The successive amplitudes were 10, 8.5 and 7.5 mm. Determine the spring stiffness and coefficient of equivalent viscous damping. (8 + 12)
3. With the aid of sketches, explain free vibrations of under-damped, critically damped and over-damped systems. (20)
4. a) Explain Dynamic Amplification Factor and Frequency Ratio.  
b) Discuss in detail about Response Spectrum Method. (6 + 14)

5. A cantilever beam supporting three equal lumped masses is having mode shapes  $\phi$  and frequency of vibration ' $\omega$ ' as under:

$$\phi = \begin{bmatrix} 0.054 & 0.283 & 0.957 \\ 0.406 & 0.875 & -0.271 \\ 0.913 & -0.380 & 0.068 \end{bmatrix}$$

$$\omega = \begin{bmatrix} 3.61 \\ 24.1 \\ 75.7 \end{bmatrix} \text{ rad/sec}$$

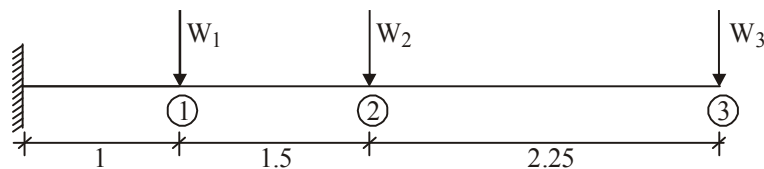


Figure -2

Write an expression for the dynamic response of mass 3( $W_3$ ) after a 35 kN step function load is applied at 2, suddenly, at time = 0 and remains on the structure permanently. Plot the history of response for the response  $0 < t < T_1$ . (20)

6. Write short note on:

(a) Implicit Method.

(b) Modal Truncation Error.

(10 + 10)

7. Compute by Numerical Method, the horizontal deflection of a frame shown in Figure 2. Plot the results up to maximum response. (20)

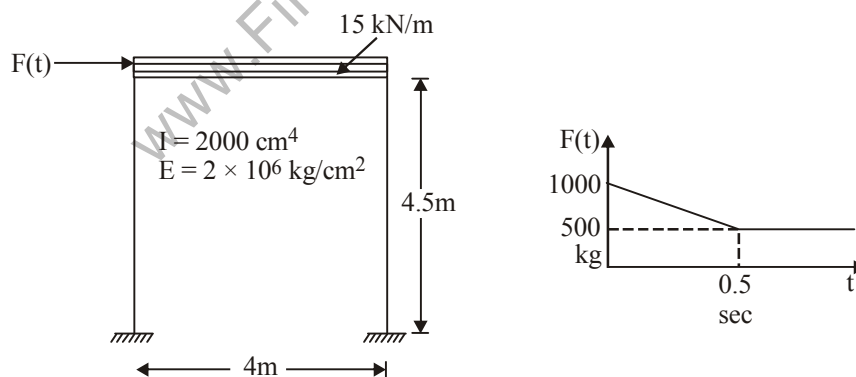


Figure - 3

8. Write note on:

(a) Eigen value problem

(b) Continuous elastic system.

(10 + 10)