Reg. No. : | | | | | | | | | | |

Question Paper Code: 42611

M.E. DEGREE EXAMINATION, NOV 2016

First Semester

Structural Engineering

14PSE101 – STRUCTURAL DYNAMICS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

1. Deterministic loadings are
   (a) Periodic (b) Non Periodic
   (c) Both (a) and (b) (d) None of these

2. The damping coefficient is greater than the value for critical damping called as
   (a) over damped system (b) amplitude
   (c) under damped system (d) logarithmic decrement

3. The structure is not subjected to any dynamic excitation, then it is called as
   (a) Forced vibration (b) Free vibration
   (c) Both (d) None of these

4. Which method is most accuracy of the results using single degree of freedom system?
   (a) Continuous sytem (b) Wilson ϴ method
   (c) Direct integration method (d) New mark beta method

5. The acceleration various in Wilson – θ method from
   (a) t to t + θ Δ t (b) t to t - θ Δ t
   (c) Both (d) None of these

PART - B (5 x 3 = 15 Marks)

6. Differentiate Static Problem from Dynamic Problem.

7. Differentiate undamped free vibration and undamped forced vibration.

8. Compare Lumped Mass and Consistent Mass.

9. Differentiate linear and nonlinear vibration.

10. How natural frequency is useful in dynamic analysis of a structure?

PART - C (5 x 16 = 80 Marks)

11. (a) (i) A SDOF system consists of a mass of 20 kg, a spring of stiffness 2200 N/m and a dashpot with a damping coefficient of 60 N-s/m is subjected to harmonic excitation of F = 200 Sin 5t N. Write the complete solution of the equation of motion. (12)

(ii) Explain the various methods used for evaluation of damping in single degree of freedom system. (4)

Or

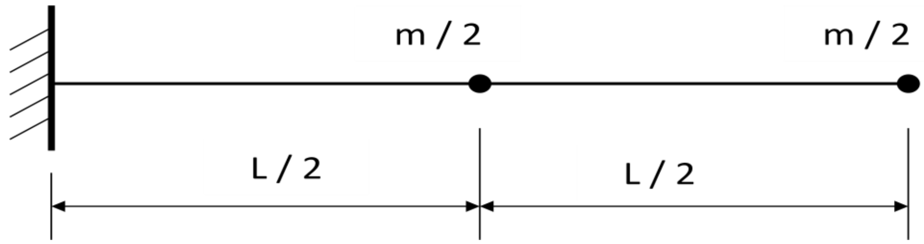
(b) A free vibration test was conducted on a SDOF System. It is observed that 60*mm* initial displacement was given by applying a horizontal force of 80*KN* through the cable and then cutting the cable suddenly after 6 complete cycles which is assumed to be 3 *sec*. The amplitude was found to be 90*mm*. Find the following

(i) Damping ratio.
(ii) Damping co- efficient.
(iii) Damped period of vibration.
(iv) Number of cycles required for the amplitude to decay 3*mm*.
(v) Logarithmic decrement. (16)

12. (a) The stiffness and mass matrix of two degree of freedom system is given by k= $\begin{bmatrix} 200 & -200 \\ -200 & 500 \end{bmatrix}$ N/m, m = $\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ kg. Determine the natural frequency and mode shape. (16)

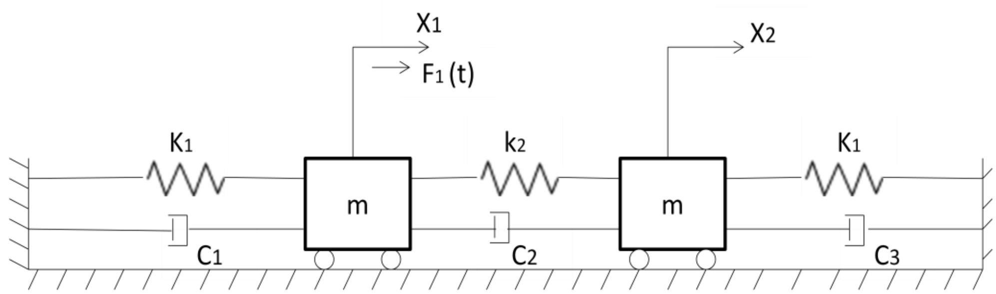
Or

(b) A cantilever beam modeled by lumping the mass as shown in Figure. The density of the material of the beam is ρ and modulus of elasticity is E. Determine the natural frequencies and mode shapes of this model. (16)



13. (a) (i) State and prove the orthogonality normality relationship. (4)

(ii) For the system whose spring – mass - damper representation is shown in the Figure, the different quantities have the following values: $F_1(t) = P_1 \cos \omega t$, $k_1 = 1000$, $k_2 = 500$, $m = 1$, $C_1 = 0.5$ and $C_2 = 0.05$. Determine the response of the masses. (12)



Or

(b) Derive the expression for undamped systems with rigid body modes using mode superposition technique. (16)

14. (a) Find the fundamental frequency of a simply supported beam with uniform mass '*m*' and uniform flexural rigidity (EI). Use Rayleigh's method. (16)

Or

(b) A mass '*m*' is attached at the midpoint of a beam of length '*l*'. The mass of the beam is small in compression to '*m*'. Determine the spring constant and frequency of free vibration of the beam in vertical direction. The beam has uniform flexural rigidity EI. (16)

15. (a) Elaborate non linear multi degrees of freedom system using Wilson's method. (16)

Or

(b) Write the step by step numerical integration techniques for non linear MDOF. (16)
