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

Question Paper Code: S41U01

M.E. DEGREE EXAMINATION, NOV 2019

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 (d) None

2. The lowest frequency of the vibration is called as.
   (a) Fundamental frequency (b) Normal frequency
   (c) Both (d) None

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

4. The _____is a widely used method used to approximate eigen values and eigen vectors.
   (a) Rayleigh–Ritz method (b) Eigen method
   (c) Numerical method (d) None of these

5. The acceleration various in Wilson – θ method from
   (a) t to $t + \theta \Delta t$ (b) t to $t - \theta \Delta t$
   (c) Both (d) None

PART - B (5 x 3 = 15 Marks)

6. Differentiate Static Problem from Dynamic Problem.

7. Define Shear building. List the approximations made to get the lateral deflection in such building.

8. Compare Lumped Mass and Consistent Mass.

9. Differentiate linear and nonlinear vibration.

10. What is the principle involved in direct integration schemes?

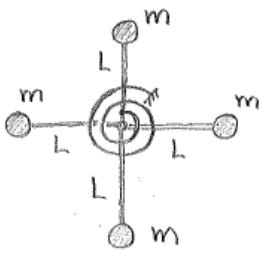
PART - C (5 x 16 = 80 Marks)

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)

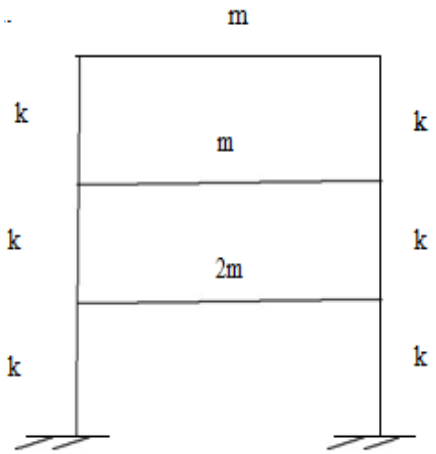
(ii) Explain the various methods used for evaluation of damping in single degree of freedom system. (4)

Or

(b) A simple model of a fan is made up of four (weightless) rigid bars and four point masses as shown in below figure. The bars are rigidly connected to each other and attached to a frictionless joint. A torsion spring with the spring constant $k\theta$ (*Nm/rad*) is connected to the bars in the joint. Determine the equation of motion and the natural frequency of the system. (16)



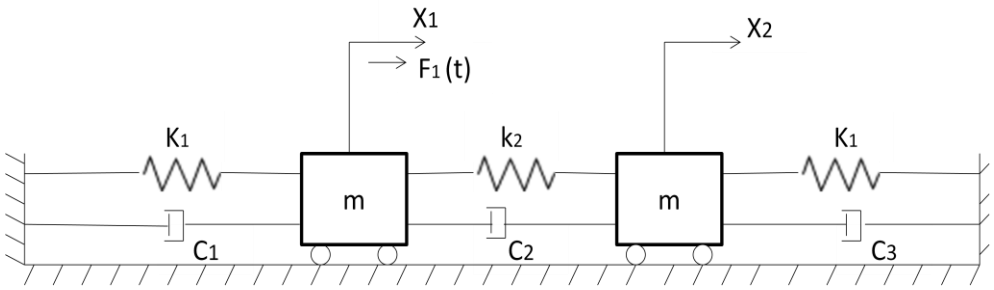
12. (a) Determine the natural frequencies and mode shapes for the framed structure shown in figure. The floor may be considered as rigid. (16)



Or

(b) Show that the displacement of a critically damped system due to initial displacement u_0 and velocity u_0. (16)

13. (a) 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. (16)



Or

(b) For a two stored frame with viscous damping shown in Figure. 3. Determine displacement by mode superposition method. The stiffness is equal for all story it is 50 *kN/m*. (16)

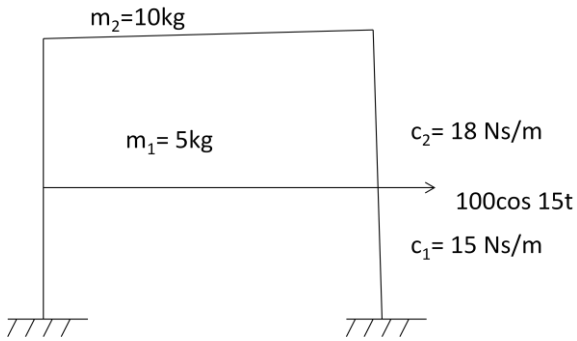


Figure. 3

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) Explain the Wilson theta method for non linear MDOF system. (16)

Or

(b) Write short notes on (16)

(i) Wilson Θ method

(ii) The central difference method

(iii) Direct integration method

(iv) Finite difference method