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

Question Paper Code: 41262

M.E. DEGREE EXAMINATION, DECEMBER 2014.

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 system is assumed to be a conservative one in
   (a) Energy method (b) Rayleigh's method
   (c) Both (d) None

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. Write short note on Rayleigh-Ritz method for continuous beam.

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

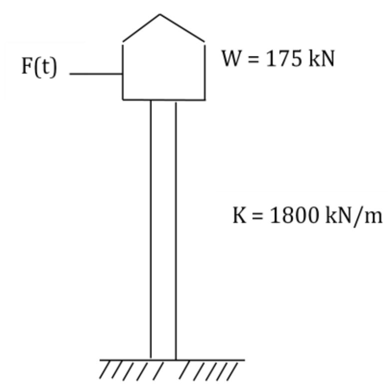
PART - C (5 x 16 = 80 Marks)

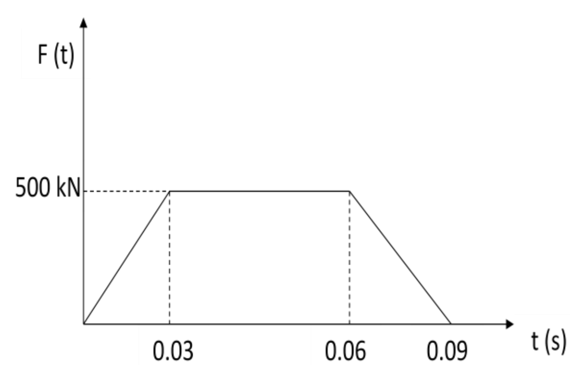
11. (a) (i) A SDOF system consists of a mass of 20 kg, a spring of stiffness 2200 N/m and a dashpot with a damping coefficient of 60 N-s/m is subjected to harmonic excitation of F = 200 Sin 5t N. Write the complete solution of the equation of motion. (12)

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

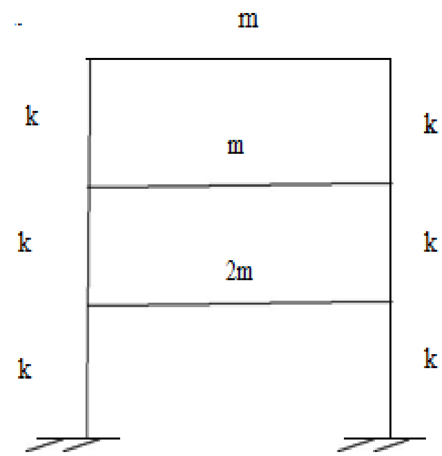
Or

(b) Determine the dynamic response of the tower given below by a numerical evaluation of Duhamel's integral due to blast loading. (16)



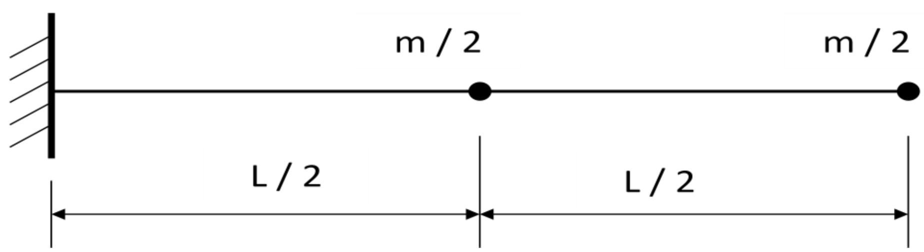


12. (a) Determine the natural frequencies and mode shapes for the framed structure shown in figure. The floor may be considered as rigid. (16)



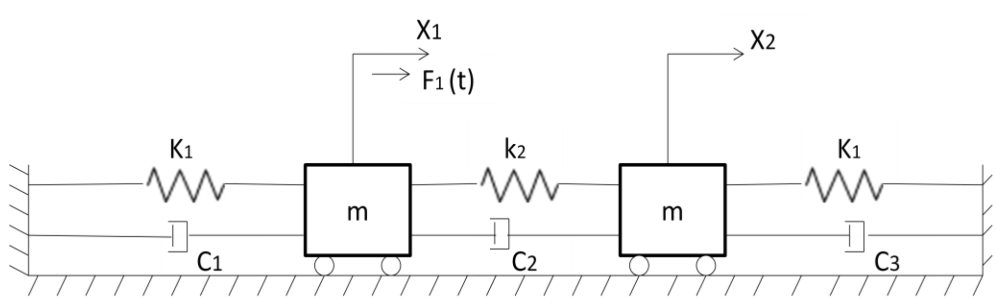
Or

(b) 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)

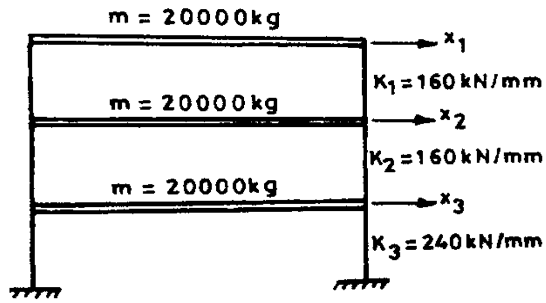
(ii) For the system whose spring – mass - damper representation is shown in the Figure, the different quantities have the following values: $F_1(t) = P_1 \mathrm{Cos}\omega t$, $k_1 = 1000$, $k_2 = 500$, $m = 1$, $C_1 = 0.5$ and $C_2 = 0.05$. Determine the response of the masses. (12)



Or

(b) (i) Write a note on mass matrix and stiffness matrix. (4)

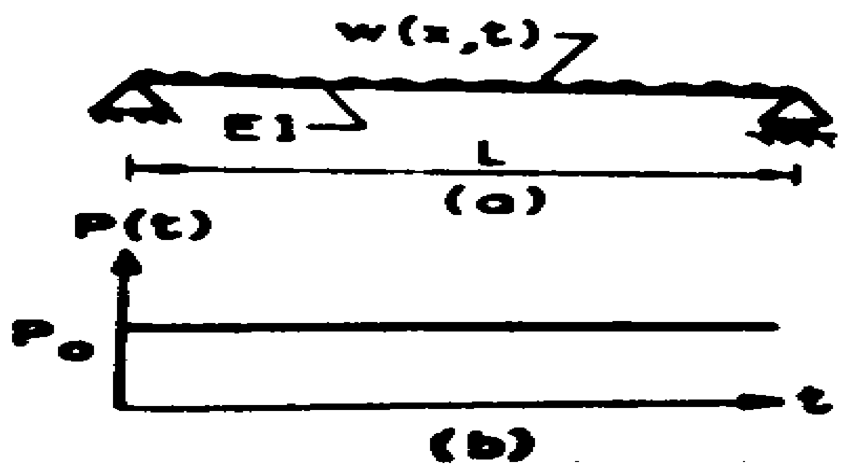
(ii) A three storey frame shown in Figure below is subjected to an excitation force of PCosωt at the top level due to steady state vibration. Determine the response at the top level, on the basis of consideration of first mode, first two modes and all three modes. For $\omega = 0$, $\omega = 0.5P_1$ and $\omega = 1.3P_2$. (12)



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 simply supported uniform beam having mass density ρ and cross sectional area A, has a distributed load, whose variation with time is shown in Figure. Derive the expression for the dynamic deflection of the beam. (16)



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

Or

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