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

Question Paper Code: 22063

M.E. DEGREE EXAMINATION, MAY 2014.

Second Semester

Structural Engineering

01PSE203-STRUCTURAL DYNAMICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

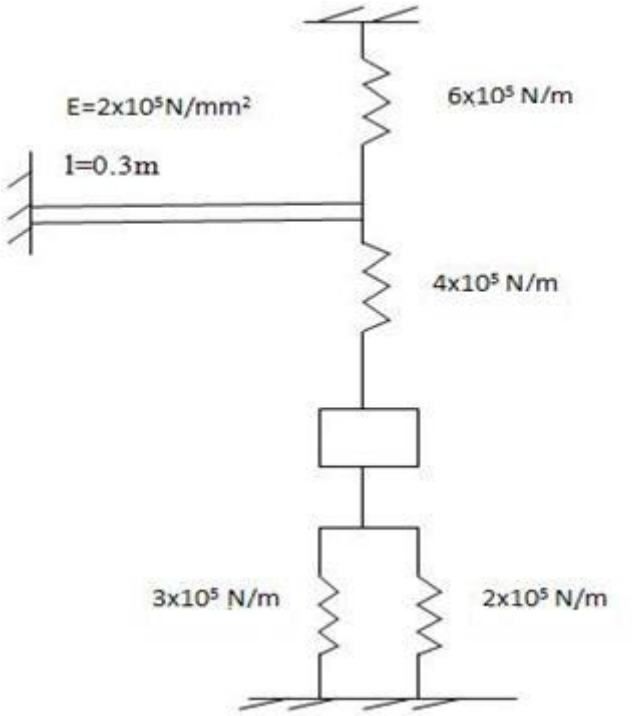
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. What is free and forced vibrations?
2. Define transmissibility.
3. What do you mean by viscous damping?
4. What are response spectra?
5. What are the methods used to extract the Eigen values?
6. List out the element forces at nodal coordinates in a simply supported beam.
7. State the law of conservation of energy.
8. Write the dynamic relation between torsional moments and rotations in a beam segment.
9. List out any two mathematical models used to determine dynamic response due to wind.
10. What is Aerodynamics?

PART - B (5 x 14 = 70 Marks)

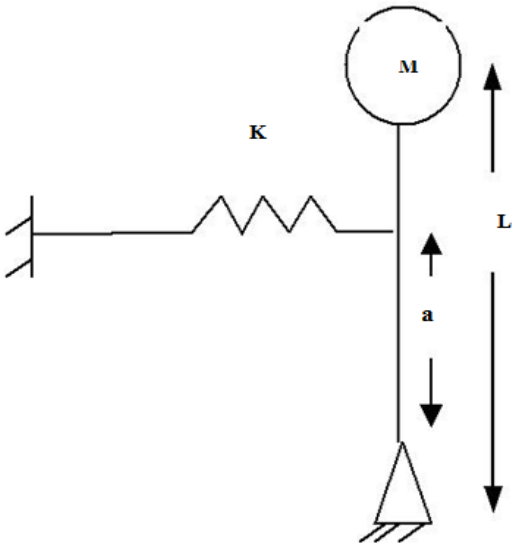
11. (a) Find the effective stiffness for the following system.



(14)

Or

(b) Formulate the equation of motion and find the natural frequency for the following system.



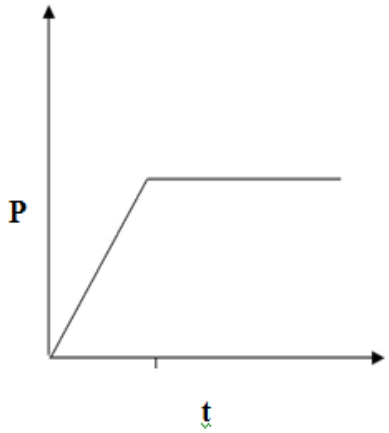
(14)

12. (a) (i) Explain logarithmic decrement. (7)

(ii) Explain vibration measuring equipments in buildings. (7)

Or

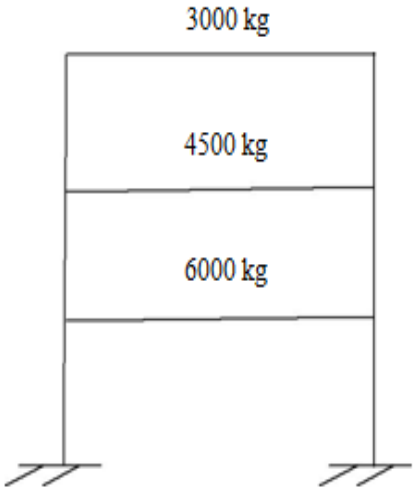
(b) (i) A SDOF system is subjected to dynamic load whose time history is given below. Obtain the response.



(7)

(ii) Explain Duhamel's integral for undamped system. (7)

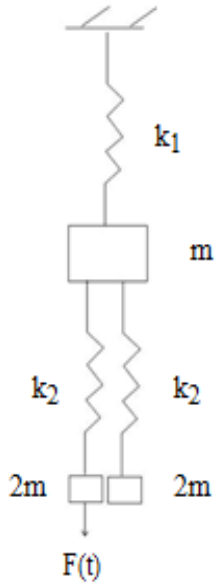
13. (a) Determine the natural frequencies and mode shapes of given MDOF system. Take EI = 4.5 x 10^6 N-m^2 for all columns. Height of each floor is 3m.



(14)

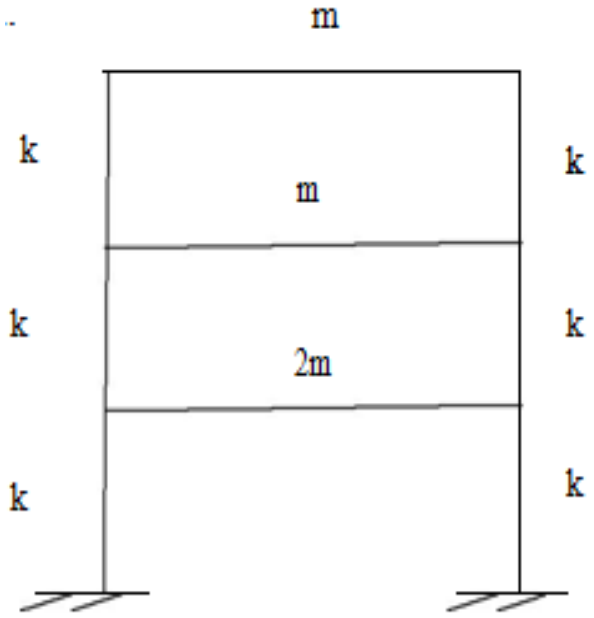
Or

(b) Determine amplitude of motion for 3 masses in figure when a harmonic force f (t) = F_0Sin λt is applied on lower left mass. Take m = 2 kg, k_1 = 1500 N/m, K_2 = 2000 N/m. F_0 = 6 N, λ = 8rad/s. Use mode superposition method.



(14)

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



(14)

Or

(b) A simply supported beam has uniformly distributed mass. By using Ritz function $y = a(x^4-2Lx^3+L^3x) + (x^2-Lx)$ where L = 1 m. Find expression for Rayleigh's quotient. (14)

15. (a) Explain the steps involved in analysis of Shear building model of a multistoried building. (14)

Or

(b) Compare open and closed system. Also explain dynamic DOFS and modeling of the systems. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) A sensitive instrument with weight 450 N is to be installed at a location where the vertical acceleration is 0.1 g at a frequency of 10 Hz. This instrument is mounted on a rubber pad of stiffness 15 KN/m and damping such that the damping ratio of the system is 10 percent.

(i) What is the acceleration transmitted for the instrument?

(ii) If the instrument can tolerate only an acceleration of 0.005 g, suggest a solution assuming that the same rubber pad is to be used. (10)

Or

(b) A portable harmonic loading machine while operated at a frequency of 20 rad/s and 30 rad/s, following response was measured. Amplitude of response is 20×10^{-3} cm and 45.8×10^{-3} cm, phase angle is 18^0 and 60^0 respectively, and force amplitude is 229.4 kgwt in each case. From this, evaluate dynamic properties of the system. (10)