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Question Paper Code : 71350

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

First Semester

Structural Engineering

ST 4102 — STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define degree of freedom.

2. What is meant by forced vibration?

3. State the concept of shear building.

4. What are normal modes of vibration?

5. Name few numerical techniques used for evaluating the nonlinear response of MDOF systems.

6. What do you mean by continuous system?

7. Differentiate intensity and magnitude of an earthquake.

8. What is micro-zonation?

9. Write few techniques to improve the seismic resistance of masonry buildings.

10. Define ductility.

11. (a) A system vibrating with a natural frequency of 6 Hz starts with an initial amplitude of 2 cm and an initial velocity of 25 cm/s. determine the natural period, amplitude, maximum velocity, maximum acceleration and phase angle. Also write the equation of motion of a vibrating system.

Or

(b) A single degree of freedom system having a mass of 2.5 kg is set into motion with viscous damping and allowed to oscillate freely. The frequency of oscillation is found to be 20 Hz and measurement of the amplitude of vibration shows two successive amplitudes to be 6 mm and 5.5 mm. determine the viscous damping coefficient.

12. (a) Determine the natural frequencies and the mode shapes for the shear building shown
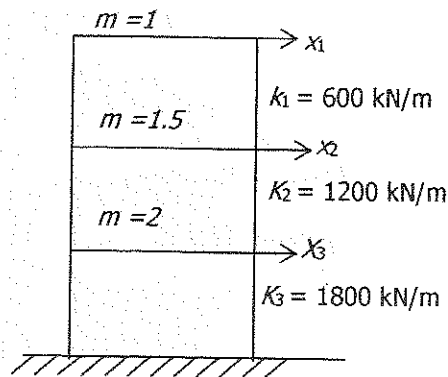

Fig. 1

Or

(b) State and prove orthogonality and normality principle of mode shapes.

13. (a) Write about Rayleigh Ritz method with its application in an example.

Or

(b) Generate step by step numerical integration algorithms for nonlinear response of MDOF system.

14. (a) Discuss the IS 1893 codal provisions for evaluation of earthquake forces for unsymmetrical structures.

Or

(b) Write a notes on :

(i) Seismic zones of India and   (7)

(ii) Seismograph   (6)

15. (a) Outline the factors affecting earthquake resistant design of masonry structures.

Or

(b) (i) Discuss the causes of structural damage under earthquake. (7)

(ii) Discuss "strong column-weak beam" concept. (6)

PART C — (1 × 15 = 15 marks)

16. (a) A three storey RC hospital building is to be constructed in Chennai. Discuss all the relevant provisions in earthquake resistant design.

Or

(b) List the major earthquake events of India and discuss the lessons learned and the improvements in Indian codal provisions thereafter.

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