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

Question Paper Code : 12291

M.E./M.Tech. DEGREE EXAMINATIONS, JANUARY 2022.

First Semester

Structural Engineering

ST 4102 — STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(Regulations 2021)

Time : Three hours Maximum : 100 marks

(Codes/Tables/Charts to be permitted, if any may be indicated IS1893 all parts, IS13920)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Degree of Freedom.
2. What is meant by damping ratio?
3. What is mode superposition?
4. Why we have to go for matrix iteration method?
5. Give example for a continuous system.
6. What are the assumption in Rayleigh-Ritz method.
7. Define seismogram.
8. What are the respective scales to represent the magnitude and intensity of earthquake?
9. Recall the purpose of shear wall.
10. What are the characteristics of rigid frame to resist earthquake forces?

PART B — (5 × 13 = 65 marks)

11. (a) A vibrating system consists of mass of 6kg, spring of stiffness 125N/m and damper with damping co-efficient of 5N-s/m. Calculate damping factor natural frequency of the system, logarithmic decrement, the ratio of two successive amplitude the number of cycles after which the initial amplitude reduces to 25%.

Or

(b) Explain the types, effects and evaluation of damping.

12. (a) Explain modal expansion theorem and its useful ness in extracting the response of MDOF system.

Or

(b) For a 3DOF system, with m1 = 2000Kg, m2 = 2200Kg, m3 = 1500Kg and K1, K2 and K3 = 40000 KN/m. Find the response at the top floor.

13. (a) Using Rayleigh-Ritz method, obtain the fundamental frequency of a Cantilever beam.

Or

(b) Generate step by step numerical integration algorithms for non linear MDOF system.

14. (a) Explain Seismic Zoning of India as per codal provision.

Or

(b) Outline the evaluation of earthquake forces as per codal provisions.

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

Or

(b) Illustrate the principles and guidelines for earthquake resistant design.

PART C — (1 × 15 = 15 marks)

16. (a) List the major earthquakes occurred in India in the past and discuss the lessons learned from out of two earthquakes among them.

Or

(b) A four storied single bay building frame is of reinforced concrete situated in Zone IV. The height between floors is 3 m. Total height of the building is 12 m. The dead load and live loads are lumped at the respective floor levels. The soil below the foundation is hard rock. It is a hospital building. Determine the total base shear and the equivalent lateral loads at the various floor levels, using the empirical method of IS 1893(Part-I). Stiffness of each column in I, II, III, IV floors is 500 kN/m, 400 kN/m, 300 kN/m, 300 kN/m respectively. The seismic weight of I, II, III, IV floors are 80kN, 80 kN, 40 kN, 40 kN respectively.