Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 50480

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

Fifth/Sixth Semester

Civil Engineering

CE 3006 – DYNAMICS AND EARTHQUAKE RESISTANT STRUCTURES

(Regulations 2021)

(Use of IS 1893 – 2016 (Part–I), IS 4326 – 2013, IS 13827 : 1993, IS 13828 : 1993, IS 13920 : 2016)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State D'Alembert's Principle.
2. Distinguish between free and forced vibration of structures.
3. What is soil-structure interaction, and how does it affect seismic response?
4. State the characteristics of strong earthquake motion.
5. How do inertia forces affect structures during earthquakes?
6. What is meant by P-Delta effect?
7. List the codal provisions for earthquake load analysis.
8. How will you determine the forces in a structure due to earthquake?
9. What is the philosophy behind earthquake-resistant design?
10. What is the concept of performance based seismic design?

PART B — (5 × 13 = 65 marks)

11. (a) A damped free vibration test is conducted to determine the dynamic properties of a one storey building. The mass of the building is 10,000 kg. Initial displacement of the buliding is 0.702 cm. Maximum displacement on the first cycle is 0.53 cm and period of this displacement cycle is 1.7 s. Determine the effective weight, undamped frequency, logarithmic decrement, damping ratio, damping coefficient, damped frequency and the amplitude after 6 cycles.

Or

(b) Find the fundamental frequency and normal modes for the beam shown in Figure 1. Assume k = 200 kN/m

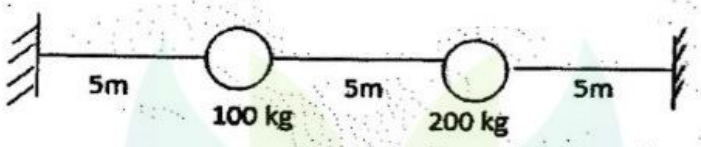

Figure 1.

12. (a) Discuss the process of seismic hazard assessment and its importance in earthquake-resistant design.

Or

(b) Explain the phenomenon of liquefaction and its impact on soil behavior and structure stability during seismic events.

13. (a) Discuss the effects of architectural features on structural behavior during seismic events.

Or

(b) Define "hysteretic behavior" and discuss its significance in RCC, steel, and prestressed concrete structures.

14. (a) Explain different methods of earthquake analysis, including equivalent static method, response spectrum method, and time-history analysis.

Or

(b) Describe the concept of design spectra and its application in earthquake load analysis.

15. (a) Explain the principles of seismic isolation and their application in earthquake-resistant design.

Or

(b) Explain the concept of ductile detailing in beam-column joints for seismic resistance.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the causes of damage observed in brick masonry, stone masonry, and reinforced concrete structures during earthquakes and lessons that have been learned from past failures of buildings due to earthquake.

Or

(b) Discuss retrofitting strategies and design considerations to enhance the seismic resistance of existing structures based on past experiences.