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**Question Paper Code : 20456**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023

Fifth Semester

Civil Engineering

CE 3006 – DYNAMICS AND EARTHQUAKE RESISTANT STRUCTURES

(Regulations 2021)

(Use of IS 4326, IS1893, IS 13920 is permitted)

(Assume any Data necessary for design based questions)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between free and forced vibration.
2. State D'Alembert's Principle.
3. What is meant by seismology?
4. Define liquefaction of soil.
5. Write any two architectural features that will influence earthquake behaviour of structures.
6. Define storey drift.
7. What is response spectrum?
8. Sketch typical time history for earthquake loading.
9. What is the basic philosophy of earthquake resistant design?
10. What are the benefits of shear wall in buildings designed in seismic, regions?

PART B — (5 × 13 = 65 marks)

11. (a) Derive the response of an undamped single degree of freedom system for its free vibrations if the initial velocity is zero but the initial displacement is  $x$ . Sketch the time-displacement curve for the first full cycle.

Or

- (b) Two equal masses each of mass  $m$ , on rollers, are connected in series by springs of equal stiffnesses  $k$  each. The first spring is anchored to a wall at one end and connected to the first mass. The second spring is connecting the first mass and the second mass. Find the natural frequencies of the system.

12. (a) Describe the causes for earthquakes and classify them based on various parameters like location and depth of epicenter, intensity and seismic waves.

Or

- (b) (i) Discuss the various parameters on which mapping is done for seismic zones. (8)  
(ii) Explain the various seismic zones in India. (5)

13. (a) With neat sketches explain the hysteretic behaviour of RCC, steel and prestressed concrete structures.

Or

- (b) Compare the failures of RCC and masonry structures in the past earthquakes and list out the lessons learnt out of them.

14. (a) Explain the process of creation of spectra from various responses spectra at a location for different earthquakes with an example.

Or

- (b) Describe the equivalent static method for earthquake analysis. What are its disadvantages?

15. (a) Give complete details of providing reinforcement for beam, columns and beam – column joints in severe earthquakes zones with neat sketches.

Or

- (b) Discuss seismic isolation principles and methods.

PART C — (1 × 15 = 15 marks)

16. (a) A ten storeyed frame-shear wall building is to be constructed in Ahmedabad. Discuss the salient aspects of planning, design and detailing for the building.

Or

- (b) A three storey masonry building with only load bearing walls is to be constructed in Chennai. With neat sketches show how will you design for earthquakes resistance.