B.E., DEGREE EXAMINATIONS: MAY/JUNE 2013

Eighth Semester

CIVIL ENGINEERING

CEE202 : Basics of Dynamics and Aseismic Design

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The maximum displacement or deformation of a vibrating system from its mean position is
   a) Free Vibration   b) Mass
   c) Amplitude   d) Stiffness

2. The first (longest) modal time period of vibration
   a) Fundamental Natural period   b) Participation period
   c) Fundamental Free period   d) Vibration of period

3. A graphical representation of the relative amplitudes of the two coordinates and their phase angle relationship.
   a) Node Shape   b) Frequency Shape
   c) Mode Shape   d) Zone Shape

4. The ratio of frequency of applied force to the natural frequency of vibration of the system
   a) Frequency cut   b) Forcing frequency
   c) Mode ratio   d) Mode cut

5. The study of earthquakes and the earth using seismic waves
   a) Geology   b) Geography
   c) Earth sciences   d) Seismology

6. A dip-slip fault in which the rock above the fault plane has moved downward to the rock below
   a) Normal fault   b) Dip-slip
   c) Active fault   d) Fault plane

7. The ratio of curvature at the ultimate strength of the section to the curvature at first yield at the section
   a) Element ductility   b) Ductility ratio
   c) Structure ductility   d) Curvature ductility

8. A curve is plotted between frequency ratio and magnification factor for a few values of P is
   a) Frequency response curve b) Frequency curve
   c) Response curve   d) Frequency magnification curve

9. Indian Standard "Criteria For Earthquake Resistant Design of Structures Part 1 General Provisions And Buildings"

   a) IS 1893(Part 1)   b) IS 456

   c) IS 13920 (Part 1)   d) IS 4326 (Part 1)

10. Indian Standard " Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice"

   a) IS 1893(Part 1)   b) IS 456

   c) IS 13920   d) IS 4326

PART B (10 x 2 = 20 Marks)

11. Write down the equation of motion of a structure in SDOF system for free and forced vibrations.

12. Distinguish between over damping and under damping systems

13. What are normal modes of vibration?

14. Write the advantages of Mode Superposition method?

15. Define the terms: Epicenter and Hypocenter

16. List out the difference between magnitude and intensity of earth quakes?

17. What is the significance of response spectrum?

18. State the importance of ductility in structures

19. Why is base isolation effective?

20. Write down the seismic design philosophy based on IS 1893 code

PART C (5 x 14 = 70 Marks)

21. a) Derive the equation of motion of single degree of freedom system for free vibration and hence find the solution for under damped system, critically damped system and over damped system.

(OR)

   b) A weight attached to a spring stiffness of 5 kN/m has a viscous damping device. When the weight was displaced and released, the period of vibration was found to be 2 seconds and the ratio of the consecutive amplitudes was 4.5 to 1.2. Determine the damped natural frequency, magnitude of the weight, amplitude and phase when a force of 4 sin 4t acts on the system.

22. a) Find the Natural frequencies and mode of the MDOF system given in Figure 1 below
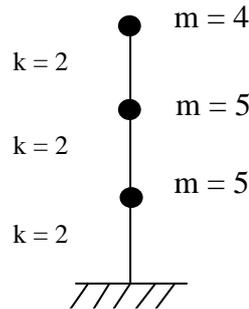
m = 4

k = 2

m = 5

k = 2

m = 5

k = 2

Figure 1

(OR)

b) Explain the concept of Mode superposition technique applicable to MDOF systems.

23. a) (i) Explain the types of seismic waves with sketches. (7)

(ii) Explain the tectonic plate theory in detail. (7)

(OR)

b) (i) Write notes on Causes of earthquake and earthquake intensity (7)

(ii) Write notes on Seismic zones of India and Information on disastrous earthquakes (7)

24. a) (i) Explain in brief the concept of design spectrum with sketches. (7)

(ii) Explain the concept of peak acceleration (7)

(OR)

b) (i) Mention the effect of soil properties and damping during earthquake. (7)

(ii) Write down the factors affecting ductility. (7)

25. a) A four storey residential building situated at Chennai is having four bays at 4 m c/c in x direction and five bays at 5 m c/c in y direction. Total height of building is 15 m (4.5 m at base and 3.5 m each for other storey). The building is supported on raft foundation resting on hard soil. The RC frame is in filled with brick masonry. The weight due to all dead load is 12 kN/m^2 on floors and 6 kN/m^2 on the roof. The floors are to cater for live load of 3 kN/m^2 on the roof. Determine the design seismic load on the structure.

(OR)

b) (i) Explain the base isolation techniques in multistory buildings (7)

(ii) Write the important points in mitigating effects of earthquake on structures. (7)

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