Register Number: ……

B.E DEGREE EXAMINATIONS: NOV / DEC 2010

Seventh Semester

CIVIL ENGINEERING

U07CE702: Basics of Dynamics and Aseismic Design Structures

(IS 1893, IS13920 and IS4326 are permitted)

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

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. The force required to produce unit deflection is called

   a) Flexibility b) Stiffness c) Damping d) Amplitude

2. The amplitude of a vibrating system is given by the expression,

   a) A = $\sqrt{x^2{}_0 + (\frac{\dot{x}_0}{\omega_n})^2}$ b) A = $\sqrt{x^2{}_0 + (\frac{x_0}{\omega_n})^2}$ c) A = $\sqrt{x^2{}_0 + (\frac{\dot{x}_0}{t})^2}$ d) A = $\sqrt{x^2{}_0 + (\frac{\ddot{x}_0}{\omega_n})^2}$

3. A load that repeats its values after some definite period is called

   a) Periodic load b) Aperiodic load c) Impulsive d) Stati

4. The Eigen vector of a MDOF system represents

   a) Frequency b) Time c) Mode shape d) Oscillator

5. If the two plates slide by one another in the same direction or in opposite direction is termed as,

   a) Convergent boundary b) Transform boundary c) Divergent boundary d) Slip

6. The quantitative measure of an earthquake is called as,

   a) Intensity b) Magnitude c) Frequency d) Damping

7. The increase in spacing of stirrups

   a) increases the ductility of the structure b) decreases the ductility of the structure

   c) either increase or decrease the ductility d) No change in the ductility

8. The dampers in which the energy is absorbed by metallic components is,

   a) Metallic b) Non-metallic c) Friction d) Viscous

9. The design horizontal seismic coefficient is given by the expression,

   a) $A_h = \frac{ZIS_a}{2Rg}$ b) $A_h = \frac{ZS_a}{2IRg}$ c) $A_h = \frac{IS_a}{2ZRg}$ d) $A_h = \frac{Z^2 IS_a}{2Rg}$

10. The maximum allowable storey drift normally used for buildings under moderate earthquake shall not exceed

    a) 0.04 times the storey height. b) 0.004 times the storey height.

    c) 0.4 times the storey height. d) 4 times the storey height.

PART B (10 x 2 = 20 Marks)

11. Differentiate static and dynamic loads giving examples.
12. Define damping. What are its types?
13. What is Duhamel's integral? Write the expression.
14. Give the equation of motion for a Two Degree of freedom system under undamped free vibration.
15. Define (i) epicenter and (ii) Hypocenter.
16. What is meant by seismogram?
17. What is meant by response spectrum of an earthquake?
18. What is meant by soil liquefaction?
19. Write a short note on Mechanism of Base isolation.
20. What is the formula to find the load factors for plastic design of steel structures?

PART C (5 x 14 = 70 Marks)

21. a) (i) List the various methods used for describing the equations of motion? Explain any one method. (6)

    (ii) A mass of 1 kg is suspended by a spring having a stiffness of 600 N/m. The mass is displaced downwards from its equilibrium position by a distance of 0.01 m. Determine the equation of motion of the system, Natural frequency of the system,Response of the system as a function of time and Total energy of the system. (8)

(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 6mm and 5.5mm. Determine the viscous damping coefficient.

22. a) Determine the equation of motion, natural frequencies and mode shapes for the model shown in figure 1.

(OR)

b) An oscillatory system with a natural frequency of 4Hz starts with initial amplitude of 1.5cm and an initial velocity of 15 cm/sec. Calculate all vibratory parameters involved and the time taken to reach the first peak.

23. a) Write notes on

(i) Plate tectonics (5)

(ii) Causes of Earthquake and seismic waves (9)

(OR)

b) (i) Compare Intensity and magnitude. (7)

(ii) What are the lessons learnt from past earthquakes for RC and masonry buildings? (7)

24. a) (i) What are the effects of liquefaction? (7)

(ii) Explain the methods available to reduce liquefaction. (7)

(OR)

b) (i)What are the methods of improving element level Ductility and Write down the steps to improve Global level Ductility? (9)

(ii) List the importance of introducing ductility in RC structures and list the factors that increase ductility in RC structures. (5)

25. a) Explain the provisions for design and detailing of flexural and compression member as per the code of practice IS 13920 for ductile detailing of RC structures.

(OR)

b) Give the step-by step procedure for the seismic analysis of a multi storied R.C building as per I.S 1893 code.

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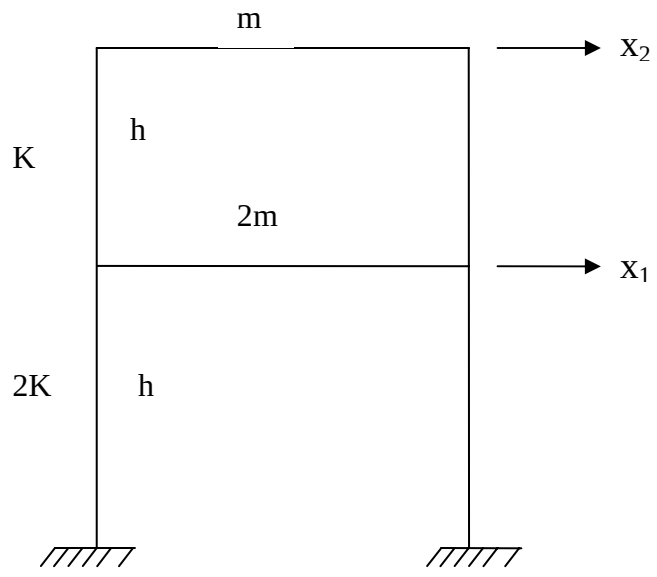

Fig. 1