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

Question Paper Code: 31174

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Seventh Semester

Civil Engineering

01UCE704 - STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

(Regulation 2013)

(IS 13920:193, IS 4326:1993 and IS1893:2002 are permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. State D'Alembert's principle.
2. A harmonic motion has a period of 0.2 *s* and amplitude of 0.4 *cm*. Find the maximum velocity and acceleration.
3. Define resonance.
4. In which property of the eigen vector facilitates the model analysis.
5. Distinguish between epicentre and hypocentre.
6. Name the intensity scales which are commonly used to seek information on the severity effects of earthquake.
7. State Bouchinger effects on steel.
8. Discuss the load combination for the reinforced and prestressed concrete structures.
9. Mention the specifications to be adopted while providing flexural members in earth-quake resistant frames.
10. Write any two factors that increase the ductility in RC structures with seismic building.

PART - B (5 x 16 = 80 Marks)

11. (a) A vibrating system consists of a mass 5 *kg*, spring of stiffness 120 *N/m* and a damper with a damping coefficient of 5 *Ns/m*. Determine the natural frequency, logarithmic decrement and the number of cycles after which the initial amplitude is reduced to 25 *%*. (16)

Or

(b) The damped frequency of a system is obtained as 9.8 *Hz* from a free vibration test during the forced vibration test with constant exciting force on the same system, the maximum amplitude of vibration is found to be at 9.6 *Hz*. Find the damping factor for the system and its natural frequency. (16)

12. (a) State and prove the orthogonality and normality property of mode shapes. (16)

Or

(b) In a three storeyed building frame, the mass *M1*, *M2* and *M3* are 1 *kg*, 1.5 *kg* and 2 *kg* respectively and stiffness are *K1, K2* and *K3* are 600 *kN/m*, 1200 *kN/m* and 1800 *kN/m*. Determine the natural frequencies and mode shapes for the shear building. (16)

13. (a) (i) Explain the measurement of earthquakes using seismograph with neat sketch. (8)

(ii) With neat sketch explain the characteristics of strong ground motion. (8)

Or

(b) Describe briefly the tectonic plate theory. How is it related to earthquake? (16)

14. (a) (i) Explain what are the lessons learnt from past earthquakes to avoid earthquakes for RC and Masonry structures. (8)

(ii) Explain the plan irregularities and vertical irregularities with neat sketch. (8)

Or

(b) (i) Define response spectrum of an earthquake and list the importance. Distinguish between the elastic and design spectrum. (8)

(ii) Explain the effect of earthquake on different types of structures. (8)

15. (a) A three storeyed symmetrical RC school building situated at Bhuj with the following data: plan dimensions-7*m*, storey height-3.5*m*, total weight of beams, slab and column and walls are 130 *kN*, 250 *kN*, 50 *kN* and 530 *kN* respectively. Live load and weight of terrace floor are 130 *kN* and 655 *kN* respectively. The structure is resting on hard rock. Determine the total base shear and lateral loads at each floor levels for 5 % of damping using seismic coefficient method. (16)

Or

(b) Write the importance of ductility in earthquake resistant design of RC buildings. And also explain the ductile detailing considerations in column members as per IS 13920:1993. (16)

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