BTS (C) – VII – 09 – 059 - V

B. Tech Degree VII Semester Examination, November 2009

CE 703 A/B EARTH QUAKE ENGINEERING

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

(Use of IS 1893 (Part 1) and IS 13920 are permitted)

PART - A

(Answer ***ALL*** questions)

(8 x 5 = 40)

I. (a) Explain 'response spectrum' and 'design spectrum'.

(b) Differentiate between intensity and magnitude of an earthquake.

(c) What are mode shapes? Sketch the first three mode shapes of a four storeyed building undergoing free vibration.

(d) What are shear walls? How do they resist lateral forces?

(e) Distinguish between free vibration and forced vibration. Write the equation of dynamic equilibrium in both the cases.

(f) Explain vibration isolation.

(g) Explain soil structure interaction effects.

(h) What is ductility? Explain rotational ductility.

PART – B

(4 x 15 = 60)

II. Explain the influence of local site effects on earthquake ground motion. (15)

OR

III. (a) What is strong motion data? What are its uses? (8)

(b) Explain the importance of strong motion studies in earthquake engineering. (7)

IV. Explain how the following building characteristics influence the performance of a building during an earthquake :

(i) Mode shapes and fundamental frequency

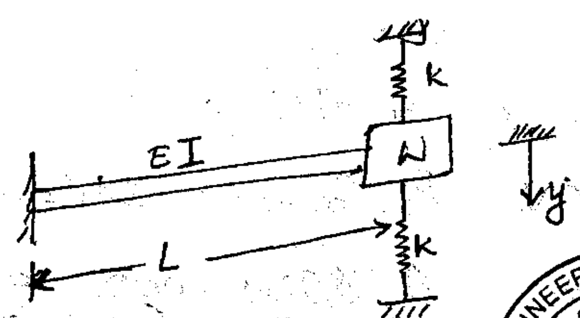
(ii) Building frequency and ground period

(iii) Damping. (15)

OR

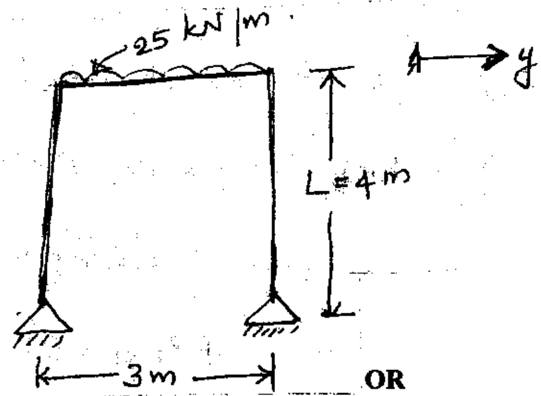
V. Explain the different lateral load resisting systems that can be used to enhance the performance of a building during earthquake. (15)

VI. (a) Determine the natural period for the system shown in figure. Assume that the beam and springs supporting the weight w are mass less. (8)



(Turn Over)

(b) Determine the natural frequency for horizontal motion of the steel frame shown in figure. Assume the horizontal girder to be rigid and neglect the mass of the columns. Take EI = 30×10^{12} N/mm^2. (7)



OR

VII. In a single degree damped vibrating system, a suspended mass of 10 Kg makes 40 oscillations in 20 seconds. The amplitude decreases to 0.25 of the initial value after 6 oscillations. Determine –

(i) the stiffness of the spring (ii) the logarithmic decrement

(iii) the damping factor (iv) the damping coefficient. (15)

VIII. A five storey reinforced concrete moment resisting framed building is to be constructed in Delhi on Type III soil. The storeys are of 3 m height. Each storey floor has a weight of 4 MN and the roof has a weight of 3 MN. Perform a seismic analysis consistent with IS 1893 : 2002 and determine –

(i) the design base shear

(ii) the lateral force at each floor. (15)

OR

IX. With neat sketches explain the ductility requirement considerations in the earthquake resistant design of

(i) Flexural members

(ii) Joints of frames. (15)

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