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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

CIVIL ENGINEERING

VII Semester

CE481/CE9402 Structural Dynamics and Earthquake Engineering

(Regulation 2004/2008)

Time: 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Define degrees of freedom with respect to structural dynamics.
2. Define critical damping
3. Differentiate free and forced vibration
4. Write briefly about mode shapes
5. List any four major earthquakes that occurred in India with magnitude
6. Define epicenter and focus of an earthquake.
7. Define liquefaction
8. List any two ways in which brick masonry construction can be made earthquake-resistant.
9. Define response spectrum
10. Explain briefly the concept of earthquake resistant design

Part – B (5 x 16 = 80 marks)

11. (i) Determine the natural frequency of the beam shown in figure 11. The moment of inertia I of the beam is 450 x 10^6 mm^4 and modulus of elasticity E = 1.8 x10^5 N/mm^2 and the stiffness of the spring is 50 x 10^6 N/m.
If the system undergoes free vibration with an initial displacement of 2 mm, find the response of the system at time 2 seconds.

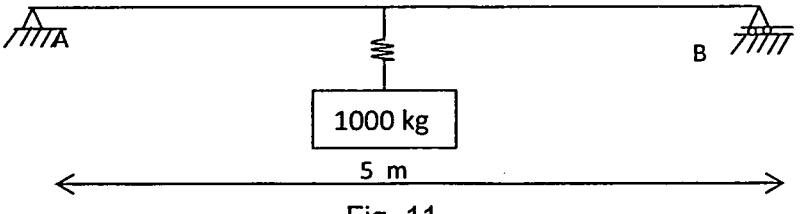

Fig. 11

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12. a) Plot the mode shapes of MDOF system as shown in Fig. 12 (a).

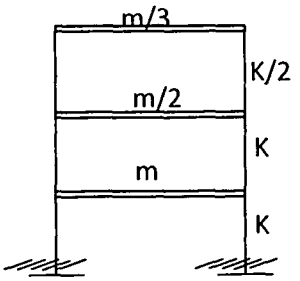

Fig. 12a

(OR)

b) Find out the response of the two degree of freedom system as shown in Fig. 12b with the initial condition $x_1(0) = x_2(0) = 0$ and $\dot{x}_1(0) = \dot{x}_2(0)$

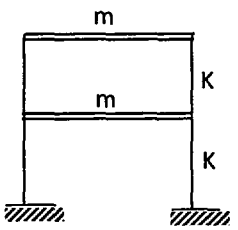

Fig. 12b

13. a) (i) List the types of seismic waves and explain each with a neat diagram [10]
(ii) Write a note on magnitude of an earthquake [6]

(OR)

b) (i) Write a brief note on the instruments used for measuring an earthquake. [6]
(ii) List the seismic features of India. Correlate the seismic features with the earthquake history of India. [10]

14. a) Explain the performance of reinforced concrete structures under past earthquakes

(OR)

b) Explain the effect of soil-structure interaction on structures during earthquake

15. a) A four-storeyed reinforced concrete (SMRF) residential building is located at Jaipur, Rajasthan (Fig. 15a). The building floors are at 3m c/c. The lumped weight due to dead loads (including slab, beam and columns) is 10 kN/m^2 on floors and 7 kN/m^2 on the roof. The floors are to cater for a live load of 2.5 kN/m^2 on floors and 1 kN/m^2 on the roof. The R. C. frames are infilled with brick-masonry. The soil condition is hard and the entire building is supported on a raft foundation. Determine design seismic load on the structure as per IS 1893:2002 and distribute the earthquake load along the height of the building.

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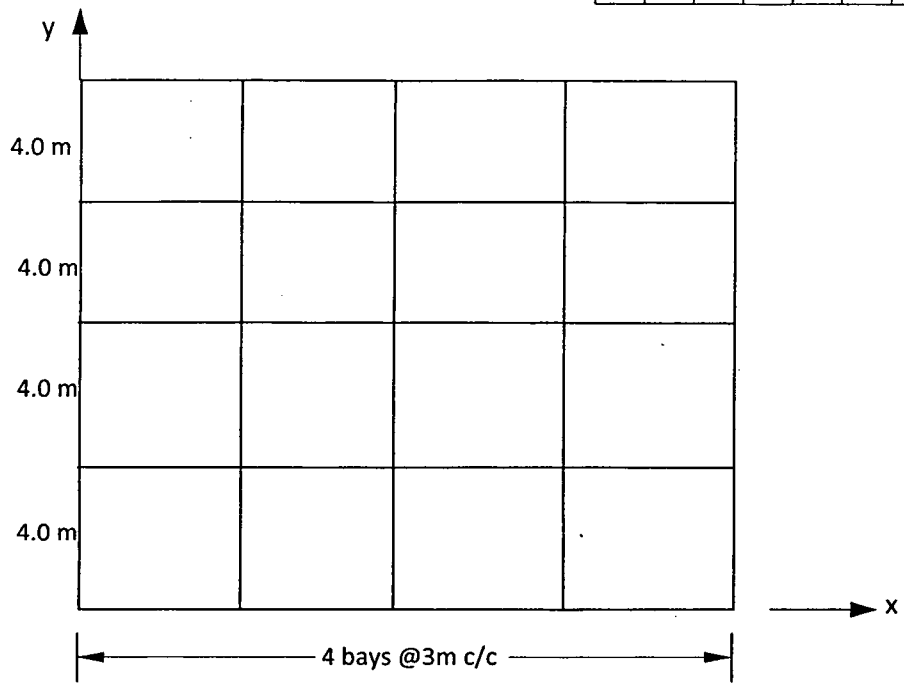

PLAN

(OR)

b) Explain the ductile detailing requirements for a beam and column as per IS:13920 with a neat sketch. Explain the importance of each condition given the code.