



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Civil Engineering

Semester End Examination; July - 2021

Earthquake Resistant Design of Structure

Time: 3 hrs

Max. Marks: 100

Note: i) Answer any **FIVE** full questions. ii) Use of IS-1893-Part-I 2016 is permitted.

- 1 a. With neat sketches, explain the following terms: 10
 - i) Benioff zone ii) Fault iii) Hypocenter iv) Inter plate and Intra plate earthquake

- b. An earthquake causes an average of 3 m strike-slip displacement over a 124 km long, 38 km deep portion of a transformed fault. Assuming the average rupture strength along the fault as 210 kN/m². Estimate the seismic moment, moment magnitude and seismic energy. 10

- 2. Explain the following: 20
 - a) Divergent boundary b) P-waves c) Lithospheric plate d) Seismic moment

- 3 a. Explain the lessons learnt from the performance of RC buildings during past earthquakes. 6

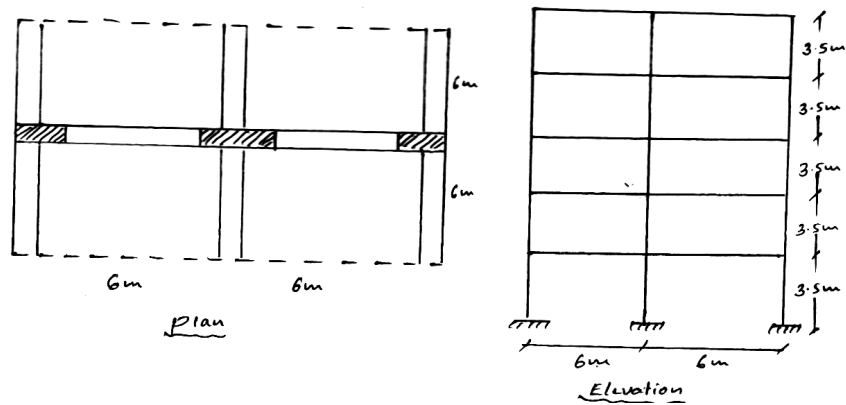
- b. Explain the terms “soft storey failure”, “floating columns” and “poundings of buildings” related to performance of buildings during earthquakes. 14

- 4 a. Discuss the architectural considerations in planning and design of earthquake resistant structures. 10

- b. Explain how damping, ductility, quality of construction and materials affecting performance of building during earthquake? 10

- 5 a. What is response reduction factor? 6

- b. A 5 storey building proposed to be constructed in New Delhi having 2 bays of 6 m each, along each of the direction. All beams and columns are of size (300 × 450 mm) and (300 × 600 mm) respectively. The RC slab is 150 mm thick and supports a live load of 3.0 kN/m² on floors and 1.5 kN/m² on roof. Height at each floor is 3.5 m. Soil is soft , wall of 200 mm thickness is provided around the building workout the seismic forces on the structure and its distribution to all the floors. Assume the frame to be a special RC moment resistant frame. 14



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- 6 a. Define masonry buildings. What materials are generally used in masonry construction? 10
What are the reasons for their poor performance under seismic excitation?
- b. Why are horizontal bands necessary in masonry buildings? 10
- 7 a. Explain briefly, basic parameters required for dynamic analysis of soil structure system. 10
- b. Explain the seismic design considerations for design of shallow foundation. 10
- 8 a. Explain with neat sketches, the code provisions made in the ductile detailing of flexural members designed for earthquake resistant design. 10
- b. Explain the following:
- i) Weak beam strong column design 10
 - ii) Effect of transverse reinforcement
- 9 a. Write a short note on the following:
- i) Isolating devices 10
 - ii) Energy dissipation devices
- b. Explain briefly non-destructive evaluation of a building. 10
- 10 a. Describe with the help of a neat sketches, restoration and strengthening of RCC beams and columns. 10
- b. Write a short note on;
- i) Masonry cracks 10
 - ii) Masonry deterioration

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