



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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, M. Tech - Civil Engineering (MCAD)

Semester End Examination; May/ June - 2019

Seismic Resistant Design of Structural System

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) IS:1893 - 2002 is permitted.

UNIT - I

- 1 a. What are epicenter and hypocenter? How epicenter is located using seismographs? 10
- b. Mention the difference between : 10
- i) Seismogram and Seismograph ii) Acceleration and Accelerograph
- 2 a. Explain with sketches, the different types of waves generated during earthquake and mention their characteristics. 10
- b. Explain strong motion characteristics and their determination. Mention the factors influencing to ground motion. 10

UNIT - II

- 3 a. Explain the concept and development of response spectrum. 10
- b. With a neat sketch, explain tripartite plot of response. Explain the displacement, velocity and acceleration sensitive regions. 10
- 4 a. What is plan irregular building? Explain how torsion is produced in plan irregular buildings? 10
- b. Explain the following with respect to earthquake resistant design : 10
- i) Base isolated structures ii) Ductility design in R.C. structures.

UNIT - III

- 5 a. Explain different lateral load resisting system in building with neat sketches. 10
- b. What is earthquake design philosophy? 4
- c. Explain the mechanism of liquefaction of soil during earthquake. 6
- 6 a. What are the load combinations used in seismic analysis of RCC structures? 6
- b. Determine the base shear and distribution of lateral force on each floor for the plan of the building shown in Fig. Q6(b). The building is for hospital with 5 storeys and height of each floor is 3.0 m. Assume live load of 3 kN/m^2 , columns $300 \times 300 \text{ mm}$, beams $300 \times 450 \text{ mm}$ and slabs 150 mm thick. Assume 230 mm thick masonry walls on all beams. Consider the soil to be hard rock and frame to be special moment resisting frame. 14

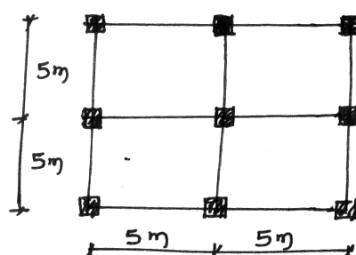


Fig. Q6(b)

UNIT - IV

- 7 a. Explain the behavior of masonry structures during earthquake. 10
- b. Explain the behavior of in-filled frames during earthquakes. Discuss how they are modelled and analyzed. 10
- 8 a. Explain the various measures of improving the earthquake resistance of masonry buildings with neat sketches. 10
- b. List and explain the geotechnical aspects of earthquake effect on structures. 10

UNIT - V

- 9 a. Explain different strategies adopted for seismic retrofitting of R.C. buildings. 10
- b. Explain in detail how compressive strength and flexural tensile strength of masonry is determined? 10
- 10. Discuss the following issues with respect to earthquake resistant design of structures :
 - a) Base isolation in R.C. structure
 - b) Behaviour of shear walls 20
 - c) Strong column weak beam concept
 - d) Ductile detailing in columns

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