USN

204CV001

Ph.D./M.S. (Engg.) by Research Degree Examination, Nov./Dec. 2024

Earthquake Resistant Structures

Time: 3 hrs. Max. Marks: 100

Note : 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data, if any assumed suitably.***
3. ***Use of Relevant IS code permitted.***

Module-1

1 a. What types of waves are generated during an earthquake? Distinguish between body waves and surface waves. **(10 Marks)**

b. Explain Magnitude and Intensity as applied to an earthquake. With a neat sketch, write a note on earthquake seismograph. **(10 Marks)**

OR

2 a. Explain different ground motion characteristics. **(05 Marks)**

b. Explain the concept of base isolation and application in structural design, with neat sketches. **(10 Marks)**

c. Explain Earthquake risk evaluation and Mitigation. **(05 Marks)**

Module-2

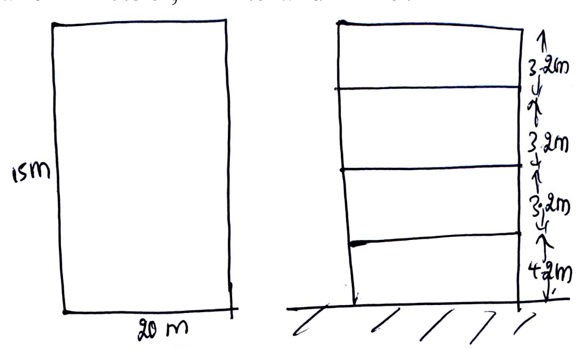
3 a. Explain briefly about design philosophy. Write the basic assumptions made in the analysis of earthquake resistant design of structures. **(10 Marks)**

b. Explain briefly the different methods of seismic analysis of structures. **(10 Marks)**

OR

4 Consider a four storey reinforces concrete office buildings of size 20 m in X direction and 15 m in Y direction as shown in Q4 (Plan and elevation below). The building is located in zone V. the soil condition is medium soil and it is proposed to design the building (type – II) with a special moment resistant frame. The lumped weight due to dead load is 12kN/m^2 on floors and 10kN/m^2 on roof. Determine the design seismic loads on the structure by static analysis as per IS 1893 – 2002 in both directions. Take Z = 0.36 , I = 1.5 and R = 5. **(20 Marks)**

Fig. Q4



PLAN ELEVATION

Module-3

5 a. Explain the concept of plan irregularities and vertical irregularities with neat sketches. **(10 Marks)**

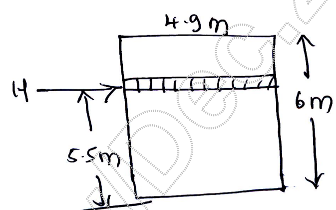
b. Determine the frequency and design seismic coefficient for an ordinary masonry shear wall in a school building located in a seismic Zone II for the following data :
Roof load P = 15 kN/m ; Height of wall h = 3.0 m ; Width of wall b = 0.2 m
Unit weight of wall w = 19.2 kN/m^3. Soil is medium Z = 0.1 , I = 1.5 , R = 1.5
Damping co-efficient = 5%. **(10 Marks)**

OR

6 a. Explain failure mechanism of unfilled masonry walls with the relevant neat sketches. **(10 Marks)**

b. Design an unreinforced 6m high and 4.9m wide masonry shear wall (centre lines of walls) as shown in the Fig. 6(b) below based on following data : Unit weight of wall r = 20 kN/m^3 f_m = 10 MPa , Seismic force at roof level H = 30 kN, Height above roof level = 0.5m , No super imposed load is applied on the wall. **(10 Marks)**

Fig. Q6(b)



Module-4

7 a. What is Ductility? Discuss the factors affecting ductility in RCC building. **(10 Marks)**

b. Explain in detail, with sketches, the ductility detailing provisions for a beam as per IS - 13920. **(10 Marks)**

OR

8 a. What are the different energy absorptions in buildings? **(08 Marks)**

b. What are the principles of earthquake resistance RC design? **(06 Marks)**

c. Explain the design and detailing of shear walls with sketches. **(06 Marks)**

Module-5

9 a. Explain Qualitative and Analytical methods of seismic evaluation. **(12 Marks)**

b. Explain any one type of local or member level retrofitting techniques for enhancing the seismic capacity of existing column, with sketches. **(08 Marks)**

OR

10 a. Explain Passive , Hybrid and Active protective system with sketches. **(15 Marks)**

b. Explain Non linear procedure of seismic analysis. **(05 Marks)**

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