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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: VIII**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 21CV8PEERD **Max Marks: 100**
Course: Earthquake Resistant Design of Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IS 1893 (2016), IS 4326 (1993), IS 13920 (2016), IS 13828 (1993) is permitted

UNIT - I

1 Explain the following with the help of sketches/expressions/examples wherever applicable; **20**
a. Focus, epi-centre, Focal depth, epi-central distance
b. Body waves and surface waves
c. Magnitude and Intensity
d. Ground motion parameters

UNIT - II

2 a) List the factors that influence the response of a structure during an earthquake. Briefly explain any two among them. **10**

b) What is a response spectrum? How is it constructed? Explain with the help of a diagram. How is it used to estimate the seismic forces? **10**

UNIT - III

3 a) Fig Q3 (a) to (e) shows some configuration of RC framed buildings. Using the provisions of IS 1893 (2016) identify the deficiency in each configuration. What are such deficiencies known as? **12**

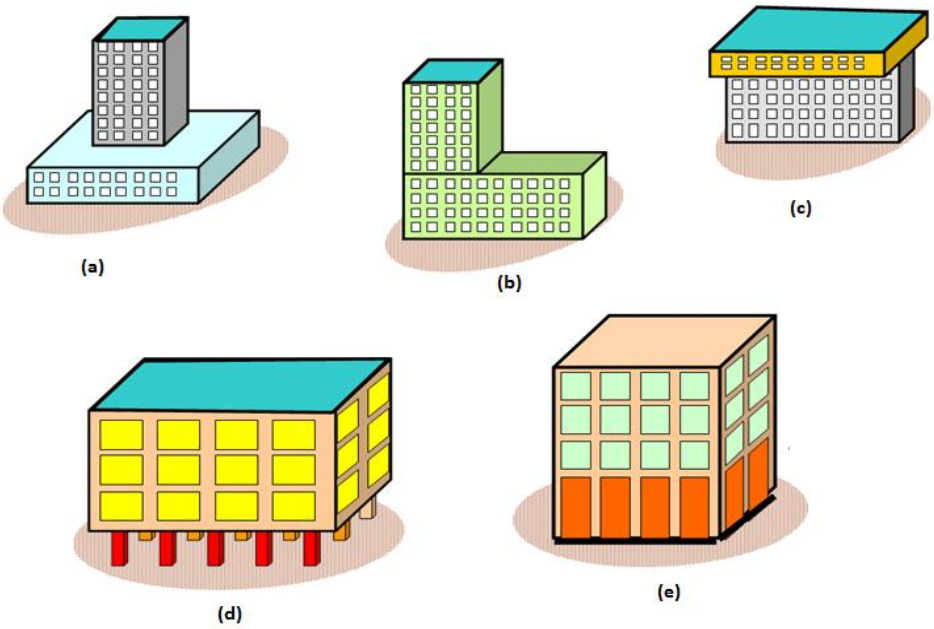

Fig Q3 (a) to (e) : RC building configurations for vulnerability assessment

b) What is a "dual" system? Sketch the plan form of a typical dual system and indicate the structural elements. What is its benefit over framed system in resisting earthquake forces? **08**

OR

4 a) List the different types of analysis for Earthquake loads as per IS1893. For what type of structures should i) Time history analysis be carried out and ii) Dynamic analysis be carried out **08**

b) Explain briefly i) Seismic Weight and Seismic Mass
ii) Base shear and Storey shear
iii) Response reduction factors
iv) Types of Irregularities **12**

UNIT - IV

5 A 3-bay, G+5 storeyed RC framed building has to be designed for seismic forces. Obtain the seismic forces at each storey. Plot the shear force and bending moment diagram for a typical interior bay of the building. **20**

The following is the data provided;

(i) Seismic zone: V
(ii) Spacing of bays: 4.2m c/c
(iii) GF Floor height: 4.5m, remaining floors: 3.0m
(iv) Span: 6.0m
(v) Structurally participating masonry in-fill wall: 200mm thick masonry with unit weight of 18.0kN/m^3, assumed to be provided on each beam
(vi) RC slab: 150mm thick, unit weight 25.0kN/m^3
(vii) Floor finish load and partition wall loads: 2.0 kN/m^2
(viii) Live load: 4.0 kN/m^2
(ix) Type of soil: medium

Occupancy: commercial complex, more than 200 persons

OR

6 Fig Q6a and 6b shows the acceleration and displacement response spectra plot, respectively, of Kobe earthquake (January 15, 1995), for 5% damping. **20**

(a) What is the peak ground acceleration?

(b) What could be the peak ground displacement?

(c) What natural frequency ranges of structures could be sensitive to (i) inertia response and (ii) displacement response?

(d) If the natural frequency of a structure is 2.86 Hz, for what spectral acceleration and displacement should it be designed?

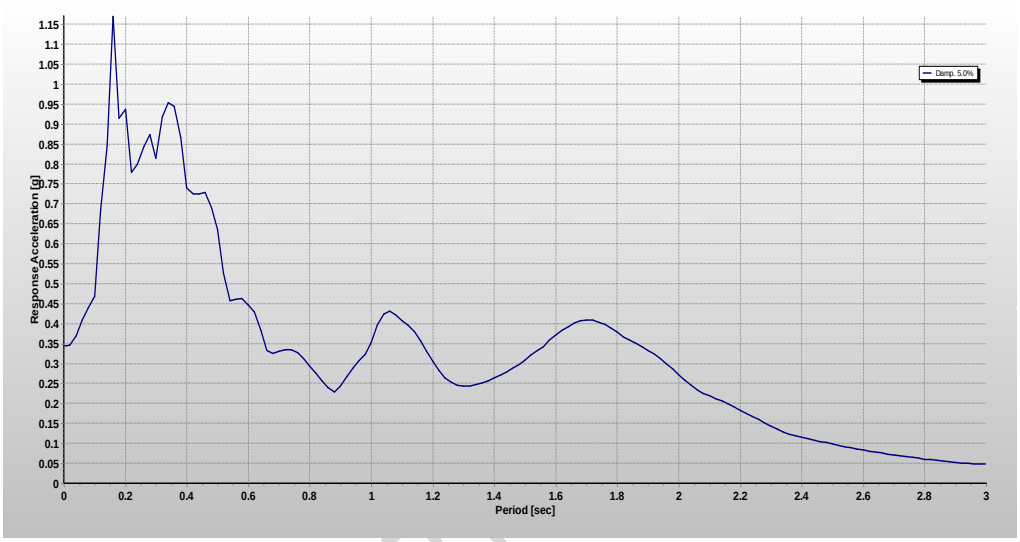

Fig. Q6a: Acceleration response spectra (15 Jan, 1995, Kobe earthquake)

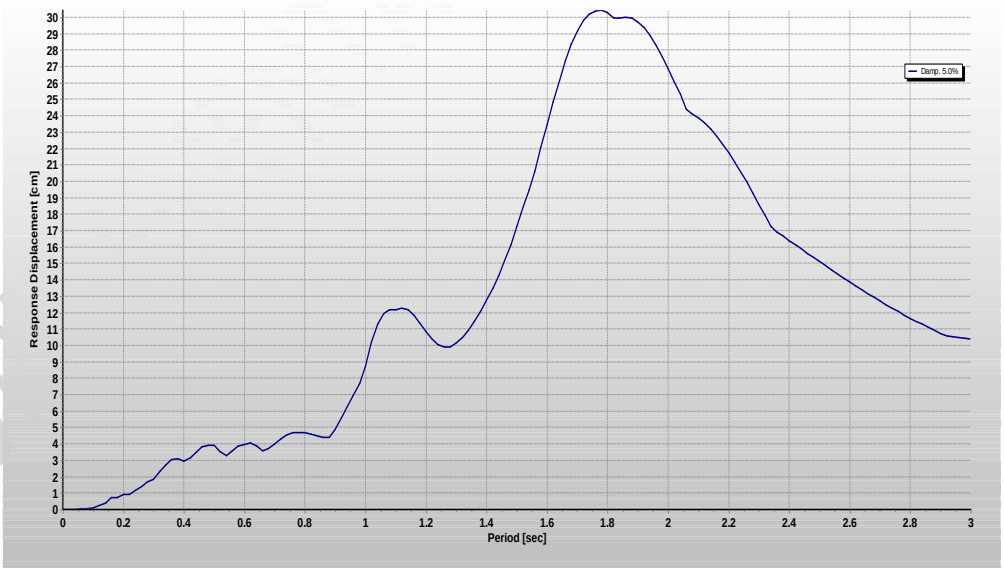

Fig. Q6b: Displacement response spectra (15 Jan, 1995, Kobe earthquake)

UNIT - V

7 The photographs [Fig Q 7 (a) to (d)] show damaged masonry buildings during an earthquake. What is the grade of damage? What are your comments on their structural performance? What could have prevented such modes of failure? **20**

Fig Q 7 (a)

Fig Q 7 (b)

Fig Q 7 (c)

Fig Q 7 (d)

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