USN | | | | | | | | | | **18CV741**

Seventh Semester B.E. Degree Examination, Dec.2024/Jan.2025
Earthquake Engineering

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS-13920-2016 code book is permitted.

Module-1

1 a. Explain the significance characteristics of seismic waves. **(08 Marks)**
   b. Write a short note on the following:
   (i)   Surface wave
   (ii) Body wave
   (iii) S - wave
   (iv) P - wave **(12 Marks)**

OR

2 a. The epicentral intensity of an earthquake that occurred in 1870 is estimated to be 1X in MMI scale. Estimate the approximate magnitude of the earthquake. **(10 Marks)**
   b. Discuss the theory of plate tectonics with regards to cause of earthquake. **(10 Marks)**

Module-2

3 a. Differentiate between Forced and Free vibration. **(08 Marks)**
   b. Consider a SDOF system with mass, $m = 2 \times 10^3$ kg stiffness, $K = 60$ kN/m and damping, $C = 0.44$ kN.sec/m. Using the response spectra of EI - Centro, 1940 earthquake. Compute:
   (i)   Maximum relative displacement
   (ii) Maximum base shear **(12 Marks)**

OR

4 a. Discuss the basic concept of structural dynamics. **(06 Marks)**
   b. Enumerate single degree of freedom system with neat sketch. **(08 Marks)**
   c. Explain in detail the dynamic equation of equilibrium. **(06 Marks)**

Module-3

5 a. How pounding can occur between adjoining buildings due to horizontal vibrations? **(10 Marks)**
   b. Explain different lateral loads resisting system with neat sketch. **(10 Marks)**

OR

6 a. What are the types of Architectural aspects which affect the seismic resistance of structure? **(12 Marks)**
   b. Briefly explain different vertical irregularities and their consequences. **(08 Marks)**

Module-4

7   Plan and elevation of a four-storey reinforced concrete office building is shown in Fig.Q7. The details are as follows:

Number of storey = 4
Zone = 3
Live load = 3 kN/m
Columns = 450 × 450 mm
Beam = 250 × 400 mm
Thickness of slab = 150 mm
Thickness of wall = 120 mm
Importance factor = 1
Structure type = OMRF Building

Determine design, seismic lateral load and storey shear force distribution.
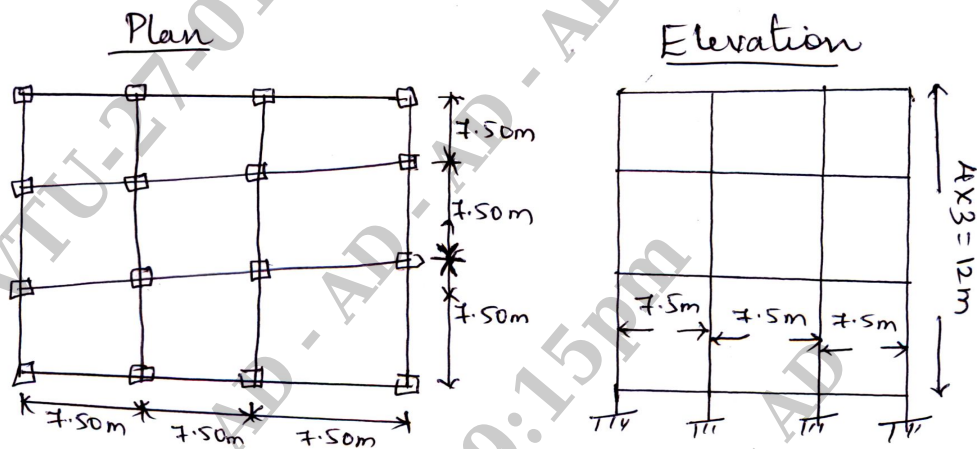

Fig.Q7   **(20 Marks)**

OR

8   For a four storeyed RCC office building located in zone V and resting on a hard rock, compute the seismic forces as per IS-1893-2002 equivalent static procedure. Height of first is 4.2 m and the remaining three stories are height 3.2 m each. Plan dimensions (length and width) of the structure are 15 m × 20 m. The RCC frames are infilled with brick masonry. Dead load on floor 12 kN/m^2 on floors and 10 kN/m^2 on roof. Live = 4 kN/m^2 on floors and 1.5 kN/m^2 on roof.

Also compute the base shear, neglecting the stiffness of infill walls. Compare the base shears for the two cases and comment on the result.   **(20 Marks)**

Module-5

9   a.   Write a note on detailing of beam - column joints to enhance ductility as per IS13920.
                                                                                    (10 Marks)
    b.   Write a note on failure pattern in masonry buildings.   **(10 Marks)**

OR

10 a.   Write a note on Retrofitting of masonry buildings and RC buildings.   **(10 Marks)**
    b.   Briefly describe concept of soft storey and explain how a frame with soft storey behave under earthquake.   **(10 Marks)**

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