2024

EARTHQUAKE RESISTANT STRUCTURES

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

"Assumptions made should be clearly stated"
*"Use of IS Code is permitted"*
"Illustrate answers with real sketches whenever required"

1.	a)	Differentiate between hypocenter and epicenter of an earthquake.	2
	b	Explain plate tectonic theory and Reid's elastic rebound theory.	8
	c)	Describe about the classification of earthquakes	10
2.	a)	Describe about the intensity and magnitude of an earthquake.	10
	b)	Derive the expression for determining the distance of an epicentre from a seismogram station.	10
3.	a)	Deduce the expression for free vibrations with viscous damping.	10
	b)	A SDOF system consist of a mass with 175 kg and a spring constant, k = 530 kN/m. While testing the system a relative velocity of 30 cm/sec was observed on application of a force of 450 kN. Determine the damping ratio, damped frequency of vibration, logarithmic decrement and the ratio of two consecutive amplitudes.	10
4.	a)	Differentiate between, i) Magnitude and intensity of earthquake. ii) Plan irregularities and vertical irregularities.	3+3= 6
	b)	What are the criteria involved in the earthquake resistant design philosophy.	4
	c)	Describe the different types of damages to buildings observed during earthquake.	10

| 5. | Plan and elevation of a four storey R.C.C. office building is shown in Fig. 1. | 20 |
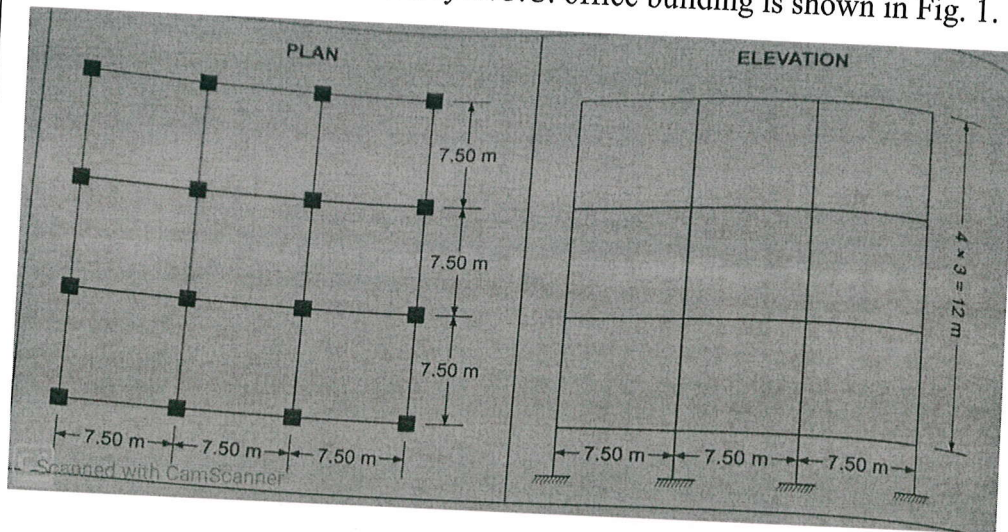
Fig. 1

The details of the building are as follows:

No of storey = 4

Zone = III

Live load = 3 kN/m^2

Columns = 450×450 mm

Beams = 250×450 mm

Thickness of slab = 150 mm

Thickness of wall = 120 mm

Importance factor = 1.0

Structure type = OMRF building

Determine the seismic lateral load and storey shear force distribution with diagram. Use static analysis.

| 6. | Design a rectangular RCC beam of span 6 m supported on RCC column to carry a point load (LL) of 100 kN at its centre in addition to its own weight. The moment due to seismic force is 5.01 kN-m and shear force is 32 kN. Use M20 Grade concrete and Fe415 Grade steel. | 20 |

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