Course No: CE F428 **Date: 14-03-2023**
Duration: 90 Mins **Max. Marks: 35**

Note: IS 1893-2016 is allowed

1. A four storey RC moment resisting frame is to be constructed in seismic zone V with medium soil. The plan and elevation are shown below. Considering that the slab thickness is 150 mm, beams are 300 x 400 mm, columns are 350 x 350 mm and the brick masonry is 300 mm thick (exterior walls only), evaluate the design base shear and lateral load distribution. Consider grade of concrete as M25, live load on floor as 4.5 kN/m², floor finish as 1 kN/m² and roof finish as 2.5 kN/m². Consider I=1 and R=5. **[15 Marks]**
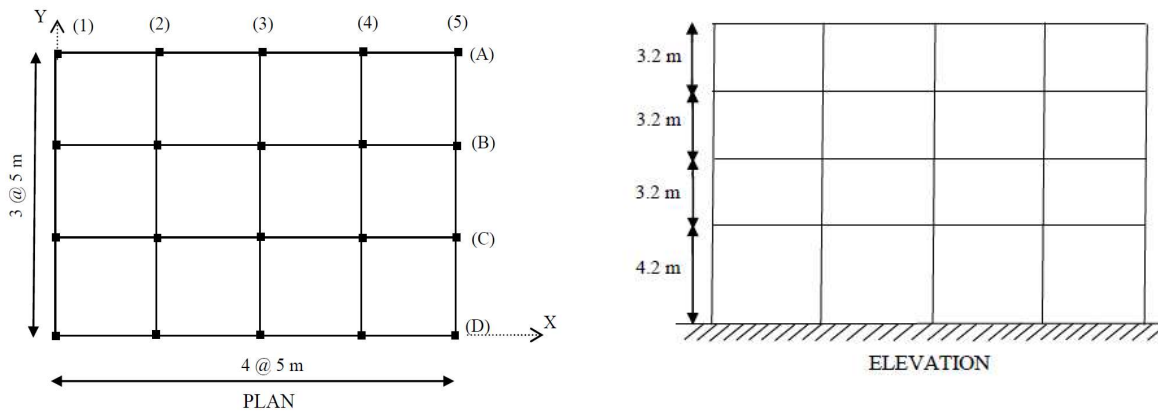

Figure 1: Plan and elevation of a four storey RC moment resisting frame

2. A four storey RC building has the following free vibration properties

	Mode 1	Mode 2	Mode 3
Natural Period (sec)	0.860	0.265	0.145
	Mode Shape		
Roof	1.000	1.000	1.000
3rd Floor	0.904	0.216	-0.831
2nd Floor	0.716	-0.701	-0.574
1st Floor	0.441	-0.921	1.016

Considering the seismic weight of the roof as 3000 kN and all the typical floors (Floor 1,2 and 3) as 4200 kN, evaluate the design loads by modal analysis method. Building is situated at rock site. Take the zone factor as 0.36, importance factor as 1 and response reduction factor as 5. **[10 Marks]**

3. Explain the elastic rebound theory highlighting the various waves generated. How are the particle motions different for different waves? **[2.5 Marks]**

4. How are the seismograms utilized to locate the epicenter of the earthquake. Illustrate with an example. **[2.5 Marks]**

5. Explain the philosophy of earthquake resistant design considering various levels of shaking.

[2.5 Marks]

6. Define response spectra. With the help of neat sketch, explain how the response spectra are generated. **[2.5 Marks]**