

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SECOND SEMESTER M.TECH. DEGREE EXAMINATION, APRIL 2018

CIVIL ENGINEERING

**10CE6106 ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES**

Max. Marks : 60

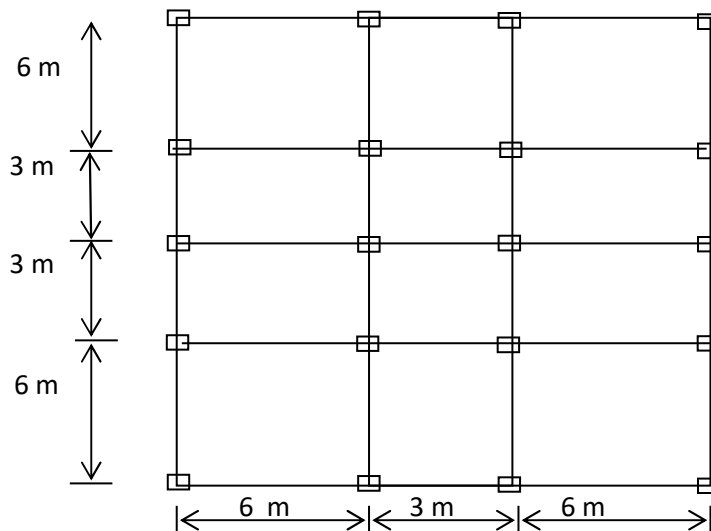
Duration: 3 Hrs.

*Use of IS 1893 Part 1, IS 1893 Part 4, IS 456:2000, SP16, IS 13920 are permitted*

**PART A (Module I-II)**

*(Answer any **two** questions :  $2 \times 9 = 18$  Marks)*

1. a) Explain the different scales for measuring earthquake magnitude. (5 marks)  
 b) Discuss the main characteristics of different types of seismic waves. (4 marks)
  
2. Plan of a five storey school building located in Zone 5 is shown in Fig. 1. Dead load including self - weight is  $5 \text{ kN/m}^2$  and live load is  $4 \text{ kN/m}^2$  on each floor and  $1.5 \text{ kN/m}^2$  on the roof. Determine the lateral forces and storey shears at different floor levels in both the orthogonal directions by equivalent static analysis.



( Fig. 1)

3. a) How is the frequency content of earthquake represented? (5 marks)  
 b) Explain the working of a seismograph. (4 marks)

### PART B (Module III-IV)

(Answer any **two** questions :  $2 \times 9 = 18$  Marks)

4. What are the characteristics of a response spectrum? Explain the construction of the elastic design response spectrum.
5. Plan of a building having 4 identical shear walls, each 5m long and 200 mm thick is shown in Fig. 2. Determine the design lateral forces in shear walls if the storey height is 4 m and the seismic force on the building is 350 kN in either direction. Assume M 25 grade concrete.

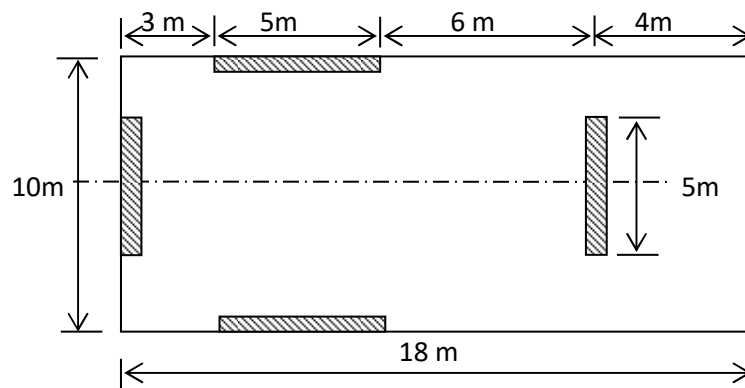


Fig. 2

6. Discuss the capacity design philosophy for earthquake resistant design of RC structures.

### PART C (Module V-VI)

(Answer any **two** questions :  $2 \times 12 = 24$  Marks)

7. a) Explain the procedure for design of shear reinforcement in beams using IS 13920. (5 marks)  
b) A circular column 3.5 m. high, 300 mm diameter is reinforced with 8 bars of 20 mm dia. as main reinforcement and 10 mm dia. at 100 mm spacing. Assuming M 25 concrete, 40 mm clear cover and Fe 415 steel, design the special confining reinforcement. (7 marks)
8. Evaluate the forces on a RC chimney of height 30 m, outer diameter at the base 2.8 m and at top 2 m, shell thickness 25 cm, lining thickness 10 cm located on medium soil in Zone 5.  $E = 2 \times 10^7 \text{ kN/m}^2$
9. Discuss the methods of rehabilitation of damaged RC elements.