

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

CIVIL ENGINEERING

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

Max. Marks: 60

Duration: 3 Hours

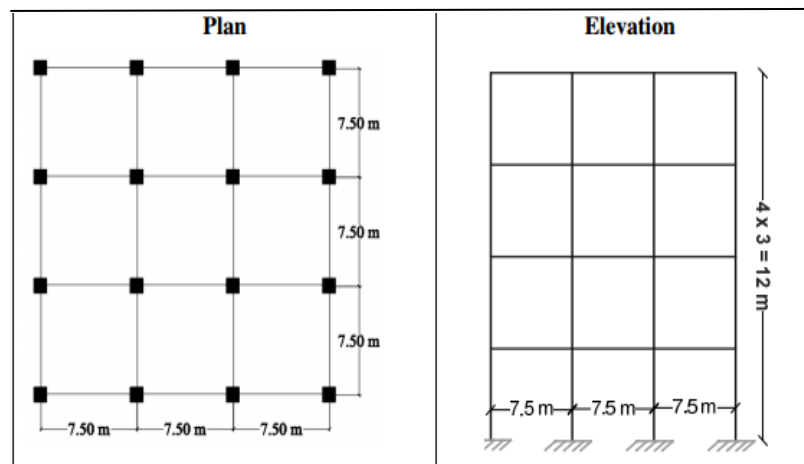
**Part A (Modules I - II)**

*(Answer any two questions : 2 x 9 = 18 Marks)*

- 1) a) What are the two measures of earthquake?  
 b) Name the two kinds of body waves and explain how they differ?

(5+4 marks)

2) Plan and elevation of a four-storey reinforced concrete office building is shown in Figure. The details of the building are as follows. Number of Storey = 4, Zone = III, Live Load = 3 kN/m<sup>2</sup>, Columns = 450 x 450 mm, Beams = 250 x 400 mm, Thickness of Slab = 150 mm, Thickness of Wall = 120 mm, Importance factor = 1.0, Structure type = OMRF Building, Determine design seismic lateral load and storey shear force distribution by Equivalent Static Lateral force method.



(9 marks)

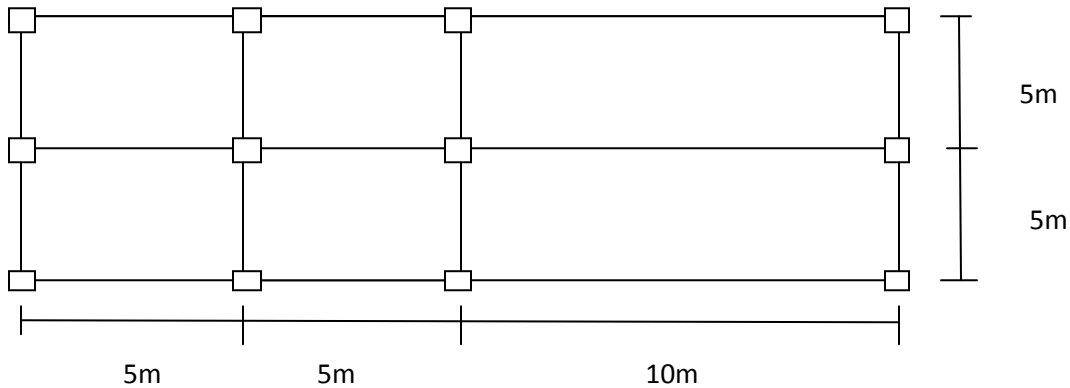
- 3a) How do human activities induce earthquakes?  
 b) Explain the seismic design philosophy and guidelines for earthquake resistant structures?

(4+5 marks)

**Part B (Modules III - IV)**

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

- 4 a) Locate the centre of stiffness for the plan of a simple one storey building as shown in figure. All the beams and columns have same cross sections.



- b) Explain the concept of capacity design philosophy? (4+5 marks)

5 a) Explain the basic principles for design and detailing of flexural members as per IS 13920?

- b) Explain the importance of ductility of structures with respect to its seismic performance?

(5+4 marks)

6) Explain the structural problems and remedial measures associated with following building configurations:

a) Soft storey frame

b) Re-entrant corners

c) Discontinuous shear wall

(3+3+3 marks)

**Part C (Modules V & VI)**

*(Answer any two questions : 2 x 12 = 24 Marks)*

7) A RCC beam of rectangular section has to carry a distributed live load of 20kN/m in addition to its own weight and a dead load of 25kN/m. The maximum bending moment and shear force due to earthquake are 60kNm and 40kN respectively. Centre to centre distance between supports is 6m. Design the beam using M20 grade concrete and Fe 415 steel. (12 marks)

8) Explain the methods of repair and rehabilitation of damaged structures? (12 marks)

9) Define shear walls? Describe the design procedure of shear wall?

(12 marks)