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# APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, APRIL 2017

CIVIL ENGINEERING

(Structural Engineering and Construction Management & Computer Aided Structural Engineering)

## 10CE6106 ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES

Max. Marks: 60 Duration: 3 Hours

**Instructions:** Any data required may be suitably assumed and clearly indicated

Use of IS 1893(Part 1): 2002, IS 1893(Part 4):2005, IS13920: 1993, IS 456:2000 and SP16 is permitted

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

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

1a) What is the significance of response reduction factor.

b) Discuss the main characteristics of seismic waves.

(4+5=9 marks)

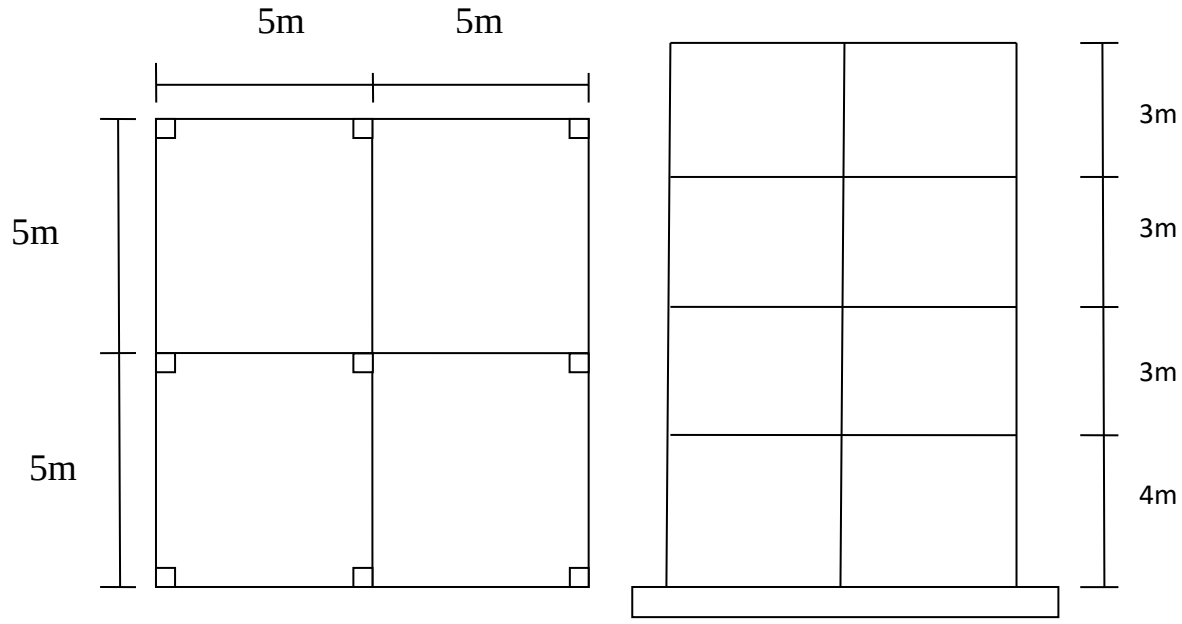
2a) Explain Plate Tectonics Theory of earthquakes.

b) Discuss briefly classification of earthquakes.

(5+4=9 marks)

3) Determine the design seismic forces for a symmetric building frame as shown in figure below. It is situated in zone IV and founded in Type II medium soil by static analysis. It has special moment resisting frames and all the frames are having infill with brick masonry. Take the lumped weight due to dead loads as 10 kN/$m^2$ for roof and 12kN/$m^2$ for floors ; live load is 1kN/ $m^2$ in roof and 4kN/$m^2$ in floors.

(9 marks)




PLAN ELEVATION

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

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

4) Explain the provisions for providing special confining reinforcement in rectangular columns with reference to IS 13920 with neat figure.

(9 marks)

5 a) Briefly describe the concepts of capacity based design.

b) How can we increase the ductility and energy dissipation capacity of a building.

(5+4=9 marks)

6 a) What is a soft storey building? How does it behave during earthquake?

b) What are the general features of an earthquake resistant building?

(5+4=9 marks)

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

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

7a) Describe the general requirements of shear wall with boundary elements.

b) Discuss the various rehabilitation techniques for RC buildings. (6+6=12 marks)

8 a) Explain briefly seismic evaluation of reinforced concrete structures.

b) Write short note on vulnerability reduction.

(7+5=12 marks)

9) Evaluate the earthquake forces on a reinforced concrete chimney located in seismic zone V and founded in raft on medium soft soil. Height of the chimney is 40m, outer diameter at base 3.5m, outer diameter at top 2.5m, thickness of shell 300mm throughout the height.

(12 marks)