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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Eighth Semester, B.E. - Civil Engineering
Semester End Examination; July - 2023
Earthquake Resistant Design of Structures

Time: 3 hrs   *Max. Marks: 100*

Course Outcomes
The Students will be able to:
CO1: Understand the basic knowledge of earthquakes and its relation to structural systems.
CO2: Apply the knowledge of engineer conception and design of structural systems against earthquakes.
CO3: Analyze the design of reinforcement concrete structural systems subjected to earthquake forces.
CO4: Summarize the retrofitting of RC and Masonry structures.

<u>**Note:**</u> **I)** PART - A *is compulsory.* **Two** *marks for each question.*
      II) PART - B: *Answer any* <u>**Two**</u> *sub questions (from a, b, c) for a Maximum of* **18 marks** *from each unit.*
      III) *IS-1893 Part–I (2016) is permitted, Assume any missing data.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	What is Inter plate and Intra plate earthquake?	2	L1	CO1	PO1,2
b.	What is storey?	2	L1	CO2	PO1,3
c.	Define design basis earthquake.	2	L1	CO3	PO2,3
d.	What is curvature ductility?	2	L1	CO4	PO1,4
e.	What is shortcrete?	2	L1	CO4	PO1,4
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Describe briefly the direct and indirect effects of earthquake.	9	L2	CO1	PO1,2
b.	Explain the two measures of earthquake, i) Earthquake magnitude ii) Earthquake intensity	9	L1	CO1	PO1,2
c.	What is site effect? Explain its significance in earthquake resistant design of structure.	9	L2	CO1	PO1,2
	UNIT - II	**18**			
3 a.	Discuss the architectural requirements of earthquake resistant construction giving emphasis on plan irregularities problems.	9	L2	CO2	PO1,3
b.	List various characteristics of buildings influencing the performance of buildings during earthquake and explain any four of them in detail.	9	L2	CO2	PO1,3
c.	Explain with sketches, various lateral loads resisting system adopted in structures.	9	L2	CO2	PO1,3

	UNIT - III	**18**		

4 a. A six storied OMRF building without brick infill panel proposed to be constructed in an area of earthquake zone V is proposed for a radio station. All the single bay portal frames are of span 6 m and height of each floor being 4 m. The total lumped mass at all the floors is 4000 kN while that at roof level is 2400 kN. Soil below the foundation is medium soil. Calculate the total base shear and plot the distribution of base shear along the height of the floor.   12   L3 CO3 PO2,3

b. A 4 storied SMRF RCC office building located is zone V resting on hard rock. Compute the seismic forces as per IS-1893-part 1-2016. Height of first storey is 4.2 m and the remaining three stories are of height 3.2 m each. Plan dimensions length and width of the structure are 15 m × 20 m. The RCC frames are filled with brick masonry.

Dead load on floor = 12 kN/m^2 and on roof 10 kN/m^2

Live load on floor = 4 kN/m^2 and on roof 1.5 kN/m^2

Computer the base shear and plot the distribution of base shear along the height of the building.   12   L2 CO3 PO2,3

c. Briefly explain the earthquake resistant and design philosophy.   6   L2 CO3 PO2,3

	UNIT - IV	**18**		

5 a. What is ductility of a structure and why it is required? What are the advantages of ductility?   9   L2 CO2 PO2,3

b. Explain in detail with neat sketches the ductile detailing provision for flexural members.   9   L2 CO3 PO2,3

c. Define liquefaction. What are the factors that affect liquefaction characteristics?   9   L1 CO3 PO2,3

	UNIT - V	**18**		

6 a. Write a short note on following:

 i) Isolation devices

 ii) Energy dissipation device   9   L2 CO4 PO1,4

b. Explain the conventional method adopted in retrofitting of RC buildings.   9   L2 CO4 PO1,4

c. Explain various modes of failure of masonry buildings with neat sketches.   9   L2 CO4 PO1,4

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