



	WINTER-2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: II	
	Name of Programme : M. Tech. Structures	Pattern: 2022	
	Name of Course: Analysis and Design of Earthquake Resistant Structures	Course Code: CIV225110A	
	Max. Marks: 60	Duration: 2.50 Hrs.	

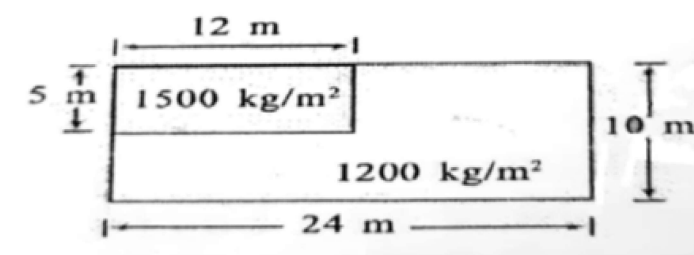
	<p>Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.</p> <ol style="list-style-type: none">1. This question paper contains 3 page(s).2. Answer to each new question is to be started on a new page.3. Assume suitable data wherever required, but justify it.4. Draw the neat labelled diagrams, wherever necessary.5. Use of IS 1893-2016 is permitted.6. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.	
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Question No. 1 Attempt following Question

- 1a) Elaborate basic difference between Magnitude & Intensity. (6) C01

Question No. 2 Attempt following Question

- 2a) A building having non uniform distribution of mass as shown in figure below. Locate its Centre of mass. (6) CO2



Question No. 3 Attempt following Question

- 3a) Explain code-based procedure for Response Spectrum analysis. (8) CO3, CO4

OR

- 3b) Explain Capacity based design & performance based design. (8) CO3, CO4

- 3c) The G+3 story RCC office building (SMRF) is founded on hard soil and situated in zone IV. The seismic weight on floors are W_1 roof = 3000 kN, $W_2 = W_3 = W_4 = 4200$ kN & the story heights are, Ground story = 4.2 m, all upper story height = 3.2m respectively. Determine Seismic load distribution on structure by equivalent Lateral force procedure. (8) CO3, CO4

OR

- 3d) Plan of a single storey building having two shear walls in each direction is shown in fig-1 The shear walls are 6 m long and 200 mm thick. Design shear force on the building is 120 kN in either direction. Determine the design lateral force in shear wall A & B using the torsion provisions of the IS code. (8) CO3, CO4

Question No. 4 Attempt following Question

- 4a) Explain why strong column and weak beam combination are considered to be more earthquake resistant than weak column and strong beam combination. (8) CO4, CO5

OR

- 4b) Explain with neat sketches ductile detailing considerations as per IS 13920 for lap splices in beam, beam web reinforcement, column & joint detailing (8) CO4, CO5

- 4c) A RCC beam of rectangular section has to carry a distributed L.L. of 15 kN/m in addition to its own weight and a D.L. of 20 kN/m. The maximum Bending moment & Shear force due to earthquake are 55 kN-m and 35 kN-m. Center to center distance between supports is 5m. Design the beam using M20 Concrete & Fe415 steel. (8) CO4, CO5

OR

- 4d) Design the reinforcement of column size 450mm x 450mm subjected to Dead load, Live load & Seismic load of 1000 kN, 800 kN & 550 kN for respectively. Column is also subjected to B.M. due to D.L., L.L., & Seismic loads of 50 kN-m, 40 kN-m & 100 kN-m respectively. The column has an unsupported length of 3m and is braced against side sway in both directions. Use M25 Concrete & Fe415 steel. (8) CO4, CO5

Question No. 5 Attempt following Question

- 5a) Explain the difference between structural behavior of Slender & Squat shear walls. (8) CO4, CO5

OR

- 5b) State IS 3370 Code provisions for water tanks. Write design procedure for elevated water tank. (8) CO4, CO5

- 5c) Calculate flexural strength of shear wall for a five story (G+4) apartment building as shown in figure 2. The unfactored axial loads due to D.L. & L.L. are 1980 kN & 648 kN respectively. The shear & B.M due to earthquake are 423 kN & 5276 kN-m respectively. The materials are M25 concrete & Fe 415 Steel. (8) CO4, CO5

OR

- 5d) Explain step by step procedure of Seismic analysis of elevated water (8) CO4, CO5

