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10CV834

Eighth Semester B.E. Degree Examination, June/July 2015
Earthquake Resistant Design of Structures

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer FIVE full questions, selecting
at least TWO questions from each part.
2. Use of IS1893-2002 permitted.**

PART – A

- 1 a. Explain the earth and its interior. (06 Marks)
b. What is the plate tectonics? What are the major tectonic plates on the earth's surface? (06 Marks)
c. Compare the seismic waves in terms of particle motion, typical velocity and other characteristics. (08 Marks)
- 2 a. Explain the different earthquake ground motion characteristics. (06 Marks)
b. What is response spectra? Explain design spectrum and its different regions. (06 Marks)
c. Explain the construction procedure of elastic and inelastic design spectrum. (08 Marks)
- 3 a. Explain the different structural modellings. (06 Marks)
b. Explain the code-based methods for seismic design. (06 Marks)
c. What are the earthquake protective systems? Explain any one control device in detail. (08 Marks)
- 4 a. Explain the different vertical irregularities. (06 Marks)
b. What are the major aspects involved in seismo resistant building constructions and explain lateral load resisting systems. (06 Marks)
c. Explain building configuration problems and solutions. (08 Marks)

PART – B

- 5 A four story reinforced concrete for hospital building is situated in Zone-IV. The heights between the floors is 3 m and total height of building is 12 m. The total lumped load on roof floor is 2500 kN and total lumped loads on First, Second and Third floor is 3000 kN each. The soil below the foundation is to be hard rock. Determine the total base shear and horizontal lateral forces on each floors as per IS: 1893-2002 codal provisions. (20 Marks)
- 6 For the 3-storey RCC (special moment resisting frame with importance factor = 1) building frame founded on soft soil and situated in zone – V. Determine the seismic forces by dynamic analysis procedure for the following data:
 $\omega_3(\text{roof}) = 392\text{kN}$, $\omega_2 = 784\text{kN}$, $\omega_1 = 1568\text{kN}$

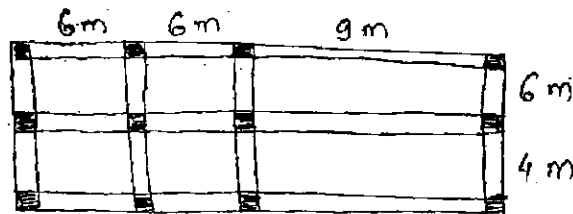
The mode shapes and natural periods are,

(20 Marks)

Natural period (Second)	Mode-1	Mode-2	Mode-3
	0.883	0.404	0.302
	Mode shapes		
Roof	1	1.0	1.00
Second floor	0.791	0.00	-0.791
First floor	0.250	-1.00	0.250

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 7 a. What are the different load combinations as per 1893-2002 to be used for seismic analysis of RCC-buildings. (05 Marks)
- b. What are the steps involved in analysis and design of sub-frames? (05 Marks)
- c. The plan of a simple one-storeyed building as shown in Fig. Q7 (c). All the columns have the same dimensions and hence the same cross-sectional area. Obtain the centre of stiffness. (10 Marks)



Plan of Building
Fig. Q7 (c)

- 8 a. Explain the elastic properties of masonry. (06 Marks)
- b. Determine the lateral forces on a two-storey unreinforced brick masonry buildings situated in zone-III for the following data:
- Plan size = $18\text{m} \times 8\text{m}$
 - Total height of building = 6.2 m
 - Storey height = 3.1 m
 - Weight of roof = 2.5 kN/m^2
 - Weight of wall = 5 kN/m^2
 - Live load on roof = 0
 - Live load on floor = 1 kN/m^2
 - Response reduction factor = 1.5
 - Consider, medium soil type

(14 Marks)
