

B.E.(Civil Engineering) Semester Seventh (C.B.S.)
Elective - I : Earthquake Resistant Design of Structures

P. Pages : 2

KNT/KW/16/7434

Time : Three Hours



Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.
 12. IS 456:2000, IS 1893-2002 Part I, IS 825, IS 13920:1993 May be consulted

1. a) Explain in brief elastic rebound theory of Earthquake. 6
- b) Describe plate tectonic theory in detail. What are the major tectonic plates on the Earth surface. 7

OR

2. a) Explain with neat sketch different seismic waves generated during earthquake. 7
- b) Explain in detail Response Spectra used in earthquake Analysis. 6
3. a) Explain with neat sketches, the seismic effects on structures. 7
- b) State the following. 6
- i) Assumptions in the earthquake resistant design of structures.
 - ii) Objectives of earthquake resistant design of structures.

OR

4. a) Explain in detail principle cause of damage to RC building. 7
- b) State the following. 6
- i) Principles of earthquake resistant design of structures.
 - ii) Damage to structural elements.
5. a) Explain various types of 2D plane frame modelling of RC building. 7
- b) Explain various seismic methods of Analysis of RC building. 7

OR

6. a) Explain foundation modeling & soil modeling (Winkler model). 7
 b) Write a note on. 7
 i) Shear wall concept. ii) Soft storey concept.

7. a) A single bay four storey reinforced concrete frame buildings is situated at Roorkee. The height between the floors is 3m and total height is 12m. The dead load & live load is lumped to 3500 kN at each floor level except for roof floor level the load is 2500kN. The soil below the foundation is assumed to be hard rock. Assume building is intended to be used as a hospital. Determine the total base shear using equivalent lateral load procedure. 14

OR

8. Find lateral load distribution at different floors of a proposed four storied building at Mumbai. The building is to be constructed in medium soil & is designed as SMRF. Use Response Spectrum method and 5% damping. Take mass of each storey is $m_1 = 10000$ kg, $m_2 = 8000$ kg, $m_3 = 6000$ kg, $m_4 = 5000$ kg, stiffness of each storey is $k_1 = 6000$ kN/m ; $k_2 = 4000$ kN/m $k_3 = 3000$ kN/m $k_4 = 3000$ kN/m. 14

<u>Eigen values</u> =	$w_1 = 3.51$	Modal participation factors
	$w_2 = 9.62$	$p_1 = 4.805$
	$w_3 = 15.84$	$p_2 = -1.368$
	$w_4 = 19.81$	$p_3 = 0.893$
		$p_4 = 0.175$

Eigen vectors :

$$Q_1 = \begin{Bmatrix} 0.095 \\ 0.150 \\ 0.250 \\ 0.406 \end{Bmatrix} \quad d_2 = \begin{Bmatrix} -0.148 \\ -0.271 \\ -0.170 \\ -0.300 \end{Bmatrix} \quad \phi_3 = \begin{Bmatrix} -0.297 \\ 0.196 \\ 0.137 \\ -0.152 \end{Bmatrix} \quad \theta_4 = \begin{Bmatrix} 0.086 \\ -0.125 \\ 0.460 \\ -0.251 \end{Bmatrix}$$

9. a) Explain in brief about seismic retrofitting. 7
 b) Write a note on comparative study of various retrofitting methods. 6

OR

10. a) Write a short note on various conventional & non-conventional methods of seismic retrofitting. 7
 b) Explain in brief various sources of weakness in RCC fame building. 6
11. a) Write a short note on various repairing techniques of masonry structures. 6
 b) Explain various is code provisions for retrofitting of masonry structures. 7

OR

12. a) Write a short note on various failure modes of masonry structures. 6
 b) Explain in brief Base isolation system. 7
