

**Elective - I : Earthquake Resistant Design of Structures**

P. Pages : 2

NKT/KS/17/7434

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. IS456 Revised, IS1893: 2002 Part – I IS875, and IS13920: 1993 may be consulted.

1. a) Explain various Magnitude and Intensity Scales. 6

b) Explain with neat sketches different seismic waves generated during earthquake. 7

**OR**

2. a) Write a note on Tsunami. 6

b) Explain in brief about various seismic zones in India. 7

3. a) What are the earthquake effects on the structure. 7

b) Write a note on seismic damages occurred during past earthquakes. 7

**OR**

4. a) Write a short note on effect of Plan and Mass irregularities on structure during earthquake. 7

b) Explain in detail the effect of architectural features on seismic behavior of the RC building? 7

5. a) Write a note on Mathematical modeling of 3D Space Frame and Reduced 3D Model. 6

b) Explain in brief various types of 2D Plane Frame modeling of RC Building Structure. 7

**OR**

6. a) Explain mathematical modeling of floor diaphragms in RC Building. 6

b) Write a short note on the following. 7

i) Foundation Modeling.

ii) Soil Modeling using Winkler Model.

7. A Five storied RCC frame hospital building is situated at Nagpur. The Height between the floors is 3m and total height of building is 15m. The length (along X direction) and width (along Y direction) of building plan at plinth level is 20m. The Dead load and Live Load is lumped at respective floor as given below. 14
- Floor 1 = 3500 kN, Floor 2 = 3000 kN, Floor 3 = 3000 kN,  
Floor 4 = 3000 kN, Floor 5 = 2800 kN  
The soil below foundation is hard rock.  
Determine the Total Base Shear along length and load distributed at each floor level.  
Draw neat sketch of frame showing the horizontal forces.

**OR**

8. A RCC beam is having following details. 14
- i) Size of Beam: 300 mm x 600 mm
  - ii) Span of Beam :4.5 m
  - iii) M20 grade of concrete and Fe415 grade of steel.
  - iv) Ultimate Bending Moment at Top of beam (kNm):  
At Left Support: 180,  
At Mid Span: 90  
At Right Support: 160
  - v) Ultimate Bending Moment at Bottom of Beam (kNm):  
At Left Support: 100,  
At Mid Span: 190,  
At Right Support: 110
- Calculate Reinforcement as per ductile detailing code with neat sketch.

9. a) Write a short note on various sources of weakness in RCC Frame building. 6
- b) Explain in brief various conventional and non conventional methods of seismic Retrofitting. 7

**OR**

10. a) Write a note on Seismic Retrofitting. 6
- b) Explain in detail Comparative study of various retrofitting methods. 7
11. a) Write a short note on Base Isolation System. 6
- b) Explain in brief various failure modes of masonry structures. 7

**OR**

12. a) Write a short note on IS Code provisions for retrofitting of masonry structure. 6
- b) Explain in brief various repairing Techniques for masonry structure. 7

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