

USN

--	--	--	--	--	--	--	--	--	--

17CV831

## Eighth Semester B.E. Degree Examination, July/August 2022 Earthquake Engineering

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of IS1893 and IS13920 are permitted.**

### Module-1

- 1 a. Define Earthquake and explain various natural and man-made Earthquake sources. (10 Marks)
- b. What is strong ground motion? State and discuss their characteristics. (10 Marks)

**OR**

- 2 a. What is meant by the focus and epicentre of an Earthquake? Explain how to locate the epicentre. (10 Marks)
- b. What are seismic waves? Explain the characteristics of different types of seismic waves. (10 Marks)

### Module-2

- 3 a. What is response spectrum? Explain how the response spectrum of displacement, velocity and acceleration is obtained. (10 Marks)
- b. Explain difference between free and forced vibration. (06 Marks)
- c. Write the equation of motion for the given SDOF system in Fig.Q.3(c). (04 Marks)

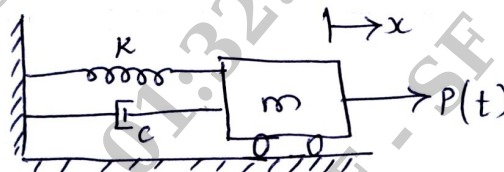


Fig.Q.3(c)

**OR**

- 4 a. Define the following:
  - i) Natural frequency
  - ii) Damped frequency
  - iii) Time period
  - iv) Damping ratio
  - v) Critical damping. (10 Marks)
- b. A vibrating system consisting of a weight of 50N and a spring with stiffness of 4N/mm is viscosity damped. The ratio of two successive amplitudes is 1:0.85. Compute:
  - i) Natural undamped frequency
  - ii) Logarithmic decrement
  - iii) Damping ratio
  - iv) Damping coefficient
  - v) Damped natural frequency. (10 Marks)



**Module-3**

- 5 a. Explain different types of plan irregularities and their consequences. (10 Marks)  
 b. Discuss briefly about seismic design philosophy. (10 Marks)

OR

- 6 a. Lateral load resisting system in building structures, explain in detail with sketches. (10 Marks)  
 b. Explain soft storey behavior during earthquake. What are the provisions of design of building with soft storey as per IS1893? (10 Marks)

**Module-4**

- 7 The plan and elevation of three storey RCC school is shown in Fig.Q.7. The intensity of DL is  $12\text{kN/m}^2$  and LL is  $4\text{kN/m}^2$ . The building is situated in zone IV. The type of soil encounter is medium soil and it is proposed to design the building with Special Moment Resisting Frame (SMRF). Determine the design seismic loads on the structure by static analysis. (20 Marks)

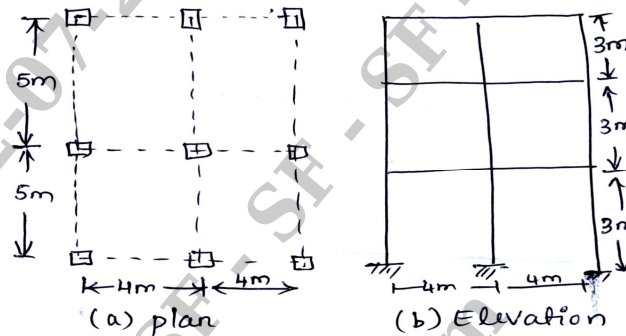


Fig.Q.7

OR

- 8 A three story RCC (SMRF) building with foundation on a soft soil, situated in zone-V. Determine seismic forces using dynamic analysis procedure  
 wt on roof = 392kN  
 wt on second floor = 784kN  
 wt on first floor = 1568kN  
 Time period {0.883, 0.404, 0.302} sec

modes  $\{\phi\}_1 = \begin{Bmatrix} 1 \\ 0.791 \\ 0.250 \end{Bmatrix}$      $\{\phi\}_2 = \begin{Bmatrix} 1 \\ 0 \\ -1.0 \end{Bmatrix}$      $\{\phi\}_3 = \begin{Bmatrix} 1 \\ -0.791 \\ 0.250 \end{Bmatrix}$  (20 Marks)

**Module-5**

- 9 a. What are the ductile detailing provisions for beam? Explain in details with sketches. (12 Marks)  
 b. Discuss about the measures taken to improve seismic behavior of masonry buildings. (08 Marks)

OR

- 10 a. Explain three different types of failure modes for a unreinforced masonry structure during an earthquake. (10 Marks)  
 b. Explain different restoration and strengthening process adopted for masonry walls. (10 Marks)

\*\*\*\*\*