CBCS SCHEME

18CV741

USN | | | | | | | | | | |

Seventh Semester B.E. Degree Examination, Feb./Mar. 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 IS-1893-2016, 13920-2016 is permitted.

Module-1

1 a. What is an earthquake? Explain the characteristics of different body waves and surface waves with neat sketches. **(10 Marks)**
   b. Explain the plate tectonic theory and its mechanism. **(05 Marks)**
   c. Explain clearly causes of earthquake and effects of earthquakes on structures. **(05 Marks)**

OR

2 a. Explain the concept of elastic rebound theory. **(06 Marks)**
   b. How earthquakes are classified? Explain. **(07 Marks)**
   c. Differentiate between Magnitude and Intensity of earthquake. **(07 Marks)**

Module-2

3 a. Derive an expression for motion of undamped single degree of freedom system subjected to free vibration. **(10 Marks)**
   b. Derive an expression for effective stiffness of springs connected in series. **(04 Marks)**
   c. Evaluate the natural frequency of and natural period for the structural system shown in Fig.Q3(c), when L = 3.6m, E = 22000 MPa, I = 1.2×10^{-4} m^4, k = 40 kN/m, m = 10 kN.
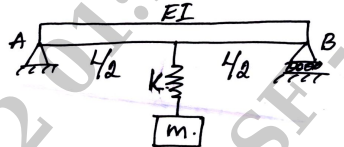

Fig.Q3(c) **(06 Marks)**

OR

4 a. Define response spectrum and design response spectrum. **(04 Marks)**
   b. Explain the method of construction of earthquake response spectrum. **(06 Marks)**
   c. A single degree of freedom system consists of mass 6 kN, and spring with stiffness 5 N/mm. The system has damping force of 200N with a velocity of 250 mm/s. Find damping ratio, damping frequency, logarithmic decrement and ratio of two consecutive amplitudes. **(10 Marks)**

Module-3

5 a. Explain the types of damages to buildings observed during past earthquakes. **(10 Marks)**
   b. Briefly explain the irregularities in plan as per IS 1893 code. **(10 Marks)**

OR

6 a. Explain the influence of building configuration on seismic response. **(07 Marks)**
   b. Explain the architectural aspects of earthquake resistant buildings. **(07 Marks)**
   c. A building having non-uniform distribution of mass is shown in Fig.Q6(c). Locate its Centre of mass. **(06 Marks)**
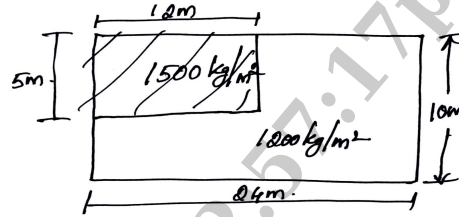
Fig.Q6(c)

Module-4

7 For the residential RCC, special moment resisting frame shown in Fig.Q7. Compute the seismic forces by equivalent static procedure. Building is founded on hard soil (rock) and situated in Zone-IV. Given $w_1 = 294.3$ kN, $w_2 = 1863.9$ kN and $w_3 = 1079.1$ kN.
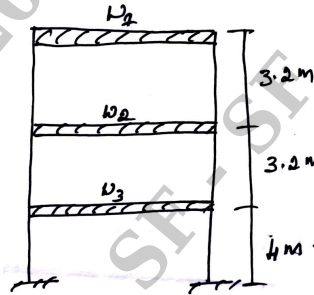

Fig.Q7 **(20 Marks)**

OR

8 The plan and elevation of a three storey building (RCC) is shown in Fig.Q8. The building is located in Zone-V. The type of soil encountered is medium stiff and it is proposed to design the building a special moment resisting. Given $w_1 = 640$ kN, $w_2 = 688$ kN, $w_3 = 688$ kN.

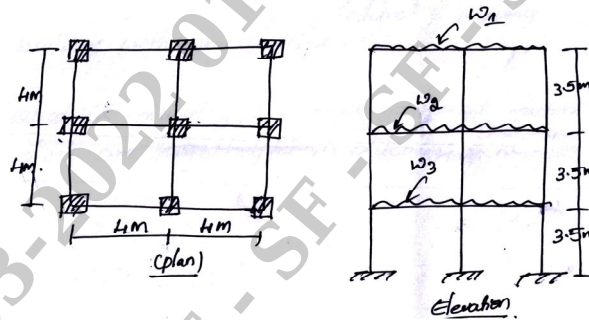| Storey level	Natural period	Mode 1	Mode 2	Mode 3
3	0.134	1.00	1.00	1.00
2	0.191	-2.038	-0.489	0.81
1	0.533	1.611	-1.223	0.45

Fig.Q8

Determine the design seismic forces and show the distribution of lateral forces with building height using dynamic analysis. **(20 Marks)**

Module-5

9 a. What are the ductile - detailing provisions for beams (for flexure and shear) as per IS code? Explain with neat sketches. **(10 Marks)**

b. Write a note on retro fitting of masonry and RCC buildings in earth quake prone areas. **(10 Marks)**

OR

10 a. Explain various modes of failure of masonry buildings with neat sketches. **(10 Marks)**

b. What is ductility? Discuss different factors which influences ductility in RC structures. **(10 Marks)**

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