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10CV834

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Earthquake Resistant Design of Structures

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO full questions from each part.*
2. Use of IS1893 (Part 1) : 2016 is allowed.

PART – A

1 a. What is an Earthquake? Write the various types of Earthquake. **(10 Marks)**

b. What are Seismic waves? Explain the characteristics of different types of seismic waves. **(10 Marks)**

2 a. Explain the difference between magnitude and intensity of earthquake. **(06 Marks)**

b. Explain response spectrum and design spectrum as applied to the analysis and design of structure. **(08 Marks)**

c. Explain the different ground motion characteristics. **(06 Marks)**

3 a. Explain the different code-based methods for seismic design. **(06 Marks)**

b. Explain the different structural modeling. **(06 Marks)**

c. A seismic station located on a bed rock of density 2580 kg/m^3 recorded an event of an epicentral distance of 96km. The difference between travel times of P-waves and S-waves was found to be 14 sec. If the average elastic of the bed rock are E = 62000MPa and G = 24400MPa. Neglecting the curvature of earth surface, estimate the focal depth of the seismic event. **(08 Marks)**

4 a. Explain with the neat sketches lateral load resisting systems. **(08 Marks)**

b. Explain building configuration, problems and solutions. **(12 Marks)**

PART – B

5 a. Explain the stepwise procedure of computation of an earthquake forces using
i) The equivalent static force procedure
ii) The dynamic analysis procedure. **(14 Marks)**

b. Summarize the philosophy of seismic design. **(06 Marks)**

6 The plan and elevation of a 3 storey RCC school building is shown in Fig.Q.6. The building is located in seismic zone-5. The type of soil encountered is medium stiff and it is proposed to design the building with a Special Moment Resisting Frame (SMRF). The intensity of dead load is 10kN/m^2 and the floors are to be cater for a imposed load of 3kN/m^2. Determine the design seismic load on the structure by static analysis.

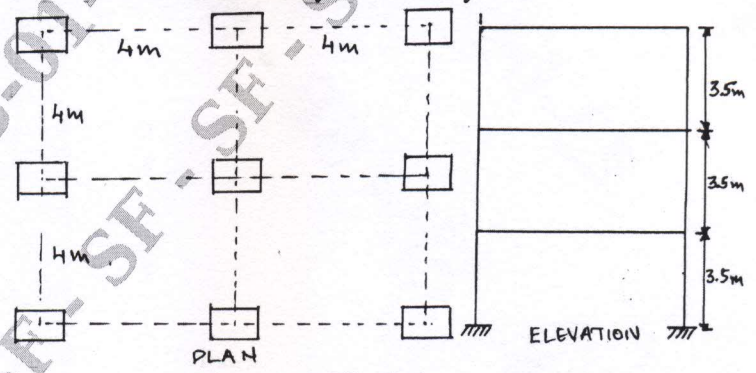

Fig.Q.6 **(20 Marks)**

7 For the Residential RCC (SMRF) building founded on soft soil and situated in zone 5. Shown in Fig.Q.7. Compute the seismic forces for each storey using dynamic analysis procedure. Given the free vibration analysis results as follows:

Frequency: $\{w\} = \{47.832, 120.155, 167.00\}$ rad/sec

$$\text{Modes}: \{\phi_1\} = \begin{Bmatrix} 1.00 \\ 0.759 \\ 0.336 \end{Bmatrix} \quad \{\phi_2\} = \begin{Bmatrix} 1.00 \\ -0.805 \\ -1.157 \end{Bmatrix} \quad \{\phi_3\} = \begin{Bmatrix} 1.00 \\ -2.427 \\ 0.075 \end{Bmatrix}$$

Seismic weights : $W_1 = W_2 = W_3 = 1962$ kN

Stiffness : $K_1 = K_2 = 160 \times 10^3$ kN/m and $K_3 = 240 \times 10^3$ kN/m

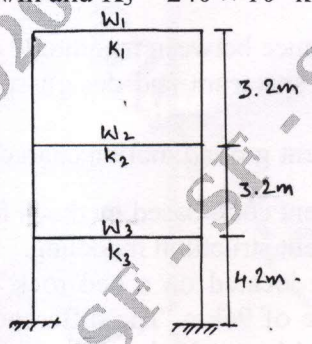

Fig.Q.7 **(20 Marks)**

8 a. Discuss the behavior of masonry buildings during Earthquakes representing failure patterns. **(10 Marks)**

b. Explain step-by-step procedure of lateral load analysis and design of two-stored masonry buildings. **(10 Marks)**

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