|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Roll No. |  |  |  |  |  |  |  |  |  |  |  |  |



**PRESIDENCY UNIVERSITY**

**Bengaluru**

|  |
| --- |
| **End - Term Examinations – JANUARY 2025** |
| **Date:** 04 / 01/ 2025 **Time:** 09:30am – 12:30pm |

|  |  |  |
| --- | --- | --- |
| **School:** School of Engineering | **Program:** B.Tech CIV | |
| **Course Code :** CIV3015 | **Course Name :** Elements of Earthquake Engineering | |
| **Semester**: VII | **Max Marks**: 100 | **Weightage**: 50% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **4** | **33** | **15** | **48** |  |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Answer ALL the Questions. Each question carries 2marks. 10Q x 2M=20M** | | | | |
| 1 | Explain any 1 seismic response control concept. | 2 Marks | L1 | CO1 |
| 2 | List the characteristics of strong ground motion. | 2 Marks | L1 | CO1 |
| 3 | Define damping. | 2 Marks | L1 | CO2 |
| 4 | List the various elements of an analytical model. | 2 Marks | L1 | CO2 |
| 5 | Write the equations of equilibrium for forced vibration of a damped SDOF system. | 2 Marks | L1 | CO2 |
| 6 | Define natural frequency. | 2 Marks | L1 | CO2 |
| 7 | What is design seismic base shear? | 2 Marks | L1 | CO4 |
| 8 | What is the importance of zone factor? | 2 Marks | L1 | CO4 |
| 9 | What do you mean by diaphragm in a structure? | 2 Marks | L1 | CO4 |
| 10 | What is the significance of response reduction factor? | 2 Marks | L1 | CO4 |

**Part B**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Answer the Questions. Total Marks 80** | | | | | |
| 11. |  | a. Explain the different types of loading on a structure. (10 Marks)  b. Compute the natural frequency in side sway for the frame shown in figure. If the initial displacement is 30mm and initial velocity is 30mm/s, what is the amplitude and displacement at t = 2s. EI = 25 x 1012 N mm2 for both columns. (15 Marks) | 25 Marks | L3 | CO2 |
| **Or** | | | | | |
| 12. | a. | Compute the natural frequency and mode shape for the 2-storey building shown in figure. Given EI = 5 x 106 Nm2 for First Floor and EI = 2.5 x 106 Nm2 for Second Floor, m1 = 600 x 103kg and m2 = 300 x 103 kg. Storey height = 4.5m for First Floor and 3.5 for Second Floor. | 25 Marks | L3 | CO2 |
|  |  |  |  |  |  |
| 13. |  | a. What is response reduction factor? Explain. (5 Marks)  b. Explain the concepts of seismic weights and live load reduction? (10 Marks)  c. What are the different load combinations taken for seismic design? (10 Marks) | 25 Marks | L2 | CO4 |
| **Or** | | | | | |
| 14. | a. | A three-storey RCC school building has a plan area of 8m x 8m and the typical storey height is 3.5m. The building is located in seismic zone V. The type of soil encountered is medium stiff and it is proposed to design the building with a special moment resisting frame with infill. The intensity of DL is 10 kN/m2 and LL is 3 kN/m2 on all floors. Determine the design seismic loads on each floor of the structure by dynamic analysis. | 25 Marks | L3 | CO4 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 15. |  | a. Explain the working of a seismograph with a neat sketch. (10 Marks)  b. Locate the center of mass of the building shown in figure. (5 Marks) | 15  Marks | L3 | CO3 |
| **Or** | | | | | |
| 16. | a. | To resist lateral loading, lateral load resisting systems are provided. Every type of lateral load resisting system has pros and cons. Give details about any 3 lateral load resisting system with a sketch. | 15 Marks | L2 | CO3 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 17. | a. | A four-storey RCC school building has a plan as shown in Fig 2 and the typical storey height is 3.5m. The building is located in seismic zone V. The type of soil encountered is medium stiff and it is proposed to design the building with a special moment resisting frame with infill. The intensity of DL is 10kN/m2 and LL is 3kN/m2 on all floors. Determine the design seismic loads on each floor of the structure by static analysis. | 15  Marks | L3 | CO4 |
| **Or** | | | | | |
| 18. | a. | A four-storey RCC residential building have seismic weight W1 = W2 = W3 = 4200kN and W4 (roof) = 3000kN. The storey height for ground floor is 4.2m and for all the other floors is 3.2m. The building is located in seismic zone IV. The type of soil encountered is hard and it is proposed to design the building with a special moment resisting frame without infill. Determine the design seismic loads on each floor of the structure by static analysis. | 15  Marks | L3 | CO4 |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***