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23381

7. Explain the concept of base isolation technique with neat sketch. Why it is required? 20
8. Discuss in detail : $5 \times 4 = 20$
- (a) Degree of freedom system
 - (b) Harmonic Excitation
 - (c) Simple harmonic motion
 - (d) D'Alemberts principle
 - (e) Duhamel's integral Multi-degrees of freedom system

M.Tech. 2nd Semester Civil Engineering
(Specialisation in Structural Engg.) Elective II
Examination, July-2022

STRUCTURAL DYNAMICS AND EARTHQUAKE

ENGG.

Paper-CE-610

Time allowed : 3 hours]

[Maximum marks : 100

Before answering the questions, candidate should ensure that they have been supplied the correct and complete questions paper. No complain in this regard, will be entertained after the examination.

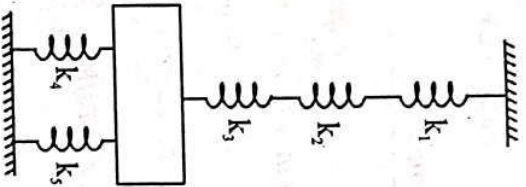
Note : Attempt five questions. All questions carry equal marks.

1. (a) Briefly explain the types of vibration. 10
- (b) A harmonic motion has a maximum velocity of 6 m/s and it has a frequency of 12 cps. Determine its amplitude and maximum acceleration. 10
2. (a) Define the natural frequencies and mode of vibration of the given system. 10

(2)

23381

- (b) Consider the system shown in figure. if $k_1 = 2000 \text{ N/m}$, $k_2 = 1500 \text{ N/m}$, $k_3 = 3000 \text{ N/m}$, $k_4 = k_5 = 500 \text{ N/m}$, Calculate the mass if the natural frequency of the system is 10 Hz. 10



3. Derive the equation of motion for single degree of freedom for free vibration and hence find the solution for
- (i) underdamped system
 - (ii) critically damped system and overdamped system.
- 20

23381

(3)

23381

4. Predict the natural frequency and mode shapes of a MDF system. The mass and the stiffness matrix of a MDF system is given by

$$[M] = m \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}, [K] = K \begin{bmatrix} 2 & -1 & 0 \\ -1 & 3 & -2 \\ 0 & -2 & 2 \end{bmatrix}$$

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5. (a) Discuss two approaches followed for the prediction of earthquakes and explain it. 10
- (b) How will you evaluate the distribution of design base shear along the height of the building. 10
6. (a) In what manner is the behaviour of a soft storey construction likely to be different from a regular construction in the event of an earthquake. Explain it. 10
- (b) Explain in detail about the various codal provisions to be followed in the earthquake resistant design of buildings. 10

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[P.T.O.]