Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 711502N **Date: 13/02/2012**

Subject Name: Structural Dynamics and Earthquake Engineering

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS 1893 – 2002 and IS 13920 is permitted.**
5. **Take Unit Weight of R.C.C. as 25 kN/m^3**

Q.1 **(a)** Attempt the following questions **07**

1) Why Open-Ground Storey Buildings should be avoided in Seismic Regions?

2) Explain importance of provision of Shear Walls in Seismic Regions?

(b) Explain the effect of Structural Irregularities on the performance of Reinforced Concrete Buildings during Earthquake **07**

Q.2 **(a)** Explain causes and remedial measures of liquefaction. **07**

(b) Write difference between: 1) Base Isolators and Seismic Dampers 2) Strengthening and Retrofitting of the structures. **07**

OR

(b) Explain Earthquake ground motion characteristics **07**

Q.3 **(a)** Explain the important features for the design of Columns and Frame Members subjected to axial load and bending moment as per IS 13920. **07**

(b) Determine the angular natural frequency in side sway for the frame fixed at base as shown in figure 1. Also calculate the natural period of vibration. Take initial velocity and displacement as 25 mm/s and 25 mm respectively. What is amplitude and displacement after 1 second. Take EI = 30 x 10^{12} N-mm^2 **07**

OR

Q.3 **(a)** Explain viscously damped free vibration system in detail. **07**

(b) A vibrating system is defined by the following parameters **07**

m = 3 kg, k = 100 N/m and C = 3 N–s /m

Determine 1. The damping factor 2. The natural frequency of damped vibration 3. Logarithmic decrement 4. The ratio of two consecutive amplitudes and 5. The number of cycles after which the original amplitude is reduced to 20 percent.

Q.4 Calculate natural frequency and corresponding mode shapes for the system shown in figure 2. Normalize modes for Mn = 1. Also verify the orthogonal conditions. **14**

OR

Q.4 **(a)** Explain the important features of ANSYS software. How this will differentiate with STAAD software? **07**

(b) Explain Structural Level Retrofitting Method and Member Level Retrofitting Method. **07**

Q.5 Calculate base shear for a 10 story R.C. frame building for a hospital located in Kohima, using seismic coefficient method for the following data **14**

1. No. of bays in X – direction - 8
2. No. of bays in Y – direction - 5
3. Bay width in both direction – 4.5m
4. Story height - 4 m
5. Thickness of Slab - 150 mm
6. Size of Beam - 300 mm x 500 mm
7. Size of Column - 300 mm x 600 mm
8. Internal wall thickness - 115 mm
9. Internal wall thickness - 230 mm
10. Live Load - 4 kN/m^2

Assume suitable data if required. Show appropriate clause number of code and draw shear distribution at each floor level.

OR

Q.5 **(a)** Discuss the components of Seismic Evaluation Methodology and how are the damages in building components identified during the process. **07**

(b) Explain the method for determination of lateral loads in masonry buildings. **07**

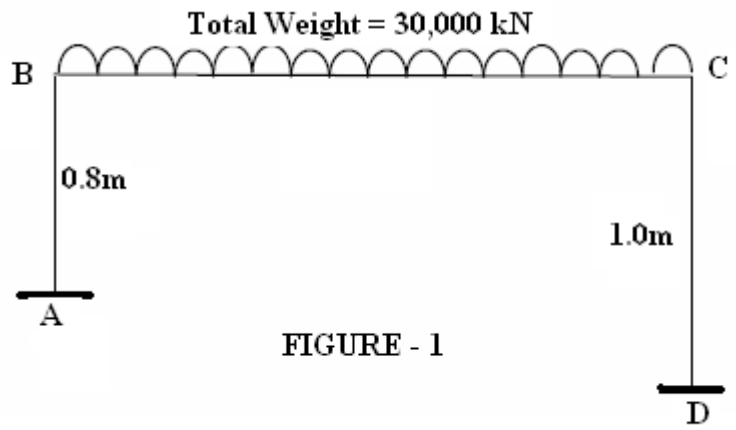

FIGURE - 1

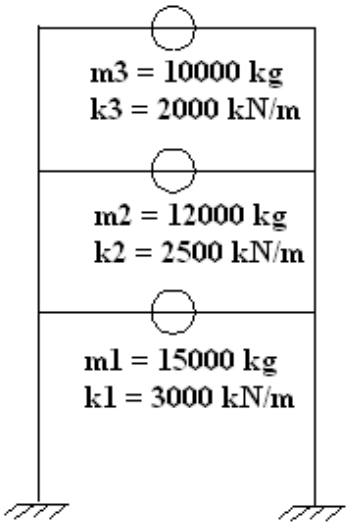

FIGURE 2

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