

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E –Ist SEMESTER–EXAMINATION – JULY- 2012****Subject code: 711502N****Date: 07/07/2012****Subject Name: Structural Dynamics and Earthquake Engineering****Time: 2:30 pm – 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. IS 1893 and IS 13920 are permitted.
5. Unit weight of R.C.C. will be taken as 25 k /m³ until otherwise stated.

Q.1 (a) Calculate base shear for the 10 story R.C. frame building for hospital building located in Earthquake Zone V, using seismic coefficient method for the following data **14**

1. No. of bays in X – direction - 8
2. No. of bays in Y – direction - 6
3. Bay width in both direction - 4 m
4. Story height - 3.5 m
5. Thickness of Slab - 150 mm
6. Size of Beam - 230 mm x 450 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/m²

Assume suitable data if required. Give your calculation with appropriate clause number of code and draw shear distribution at each floor level.

Q.2 (a) Enlist different magnitude scales used to find out earthquake magnitude. Give suitability and limitation/s for each scale. **07**

- (b)** 1. Define : Hypocenter, Natural Frequency, Focal Depth **03**
2. What is base isolation? Explain any one base isolation System **04**

OR

- (b)** Explain the behavior of masonry building under earthquake forces. Explain how the performance of masonry building can be improved along with neat sketches. **07**

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

- (b)** A mass initially at rest as shown in figure – 1 is displaced through a distance of 50 mm and released to vibrate. Determine **07**
1. Undamped and damped natural frequency
2. Amplitude after 3 cycles
3. Number of cycles when amplitude reaches to 1mm.
Take $C = 15.63 \text{ N. S / m}$

OR

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

- (b)** A Platform having weight 20 kN is supported on four equal columns which are fixed to the foundation as well as to the platform. Experimentally it is found that a force of 5 kN is applied horizontally to the platform produces a displacement of 0.2 cm. Taking damping as 5 % of critical damping determine the following **07**
1. Undamped natural frequency

2. Absolute damping coefficient
3. Logarithmic decrement
4. The number of cycles and time required for the amplitude of motion to be reduced from an initial value of 0.2 cm to 0.02 cm.

Q.4 (a) For the three storey commercial building frame, located in seismic zone V, the lumped mass of top story is 2000kg and 4000 kg for other two stories and storey stiffness 500 kN/m with rigid diaphragm, carry out the following **14**

(i) Draw mode shapes

(ii) Response spectrum analysis to find out design horizontal lateral forces for fundamental mode only.

OR

Q.4 (a) For a typical floor as shown in figure - II carry out the lateral load distribution as per IS : 1893 – 2002. All columns are of size 300 mm X 600 mm. Assume uniform mass distribution. **07**

(b) Calculate natural frequency and time period for system as shown in figure - III. Take size of central column as 500 mm x 500 mm and for other two columns size is 400 mm x 400 mm and length for all columns is 3.0 meter. **07**

Q.5 (a) Explain the important features of ANSYS software. How this will differentiate with STAAD software? **07**

(b) Explain the points to be considered for making good ductility in building for good seismic performance. **07**

OR

Q.5 (a) Explain the importance of provision of Shear Walls in Seismic Regions. **07**

(b) What is liquefaction? Explain the causes and remedial measures of Liquefaction. **07**

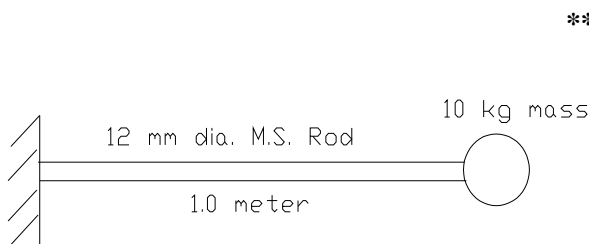


Figure - I

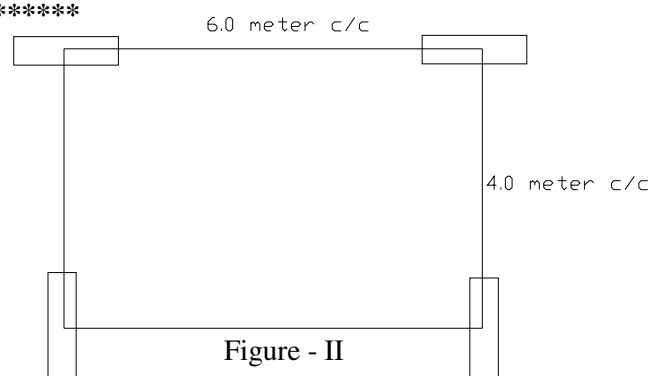


Figure - II

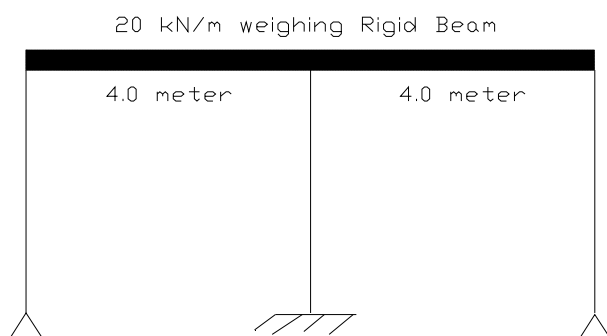


Figure - III