

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 711502N**Date: 02-12-2014****Subject Name: Structural Dynamics & 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 – 1993 is permitted.

- Q.1** (a) Explain the effects of architectural features on performance of buildings during earthquake **07**
 (b) Explain the vulnerability of open ground story during earthquake **07**
- Q.2** (a) Explain free damped SDOF structural system **07**
 (b) Attempt the following
 1. Find the natural frequency of the system shown in the fig.1 **04**
 2. Describe loss in energy due to damping. **03**
- OR**
- (b) Explain base isolation in detail **07**
- Q.3** (a) Give details of expected damages by Earthquake in structures with **07**
 1. Building frames without shear panels
 2. Floating columns
 3. Unsymmetrical plan
 (b) Explain importance of bands in masonry buildings? **07**
- OR**
- Q.3** (a) A three story building frame with uniform floor height of 3.6m is having lumped masses of 4 tonns, 3 tonns and 2 tonns at first, second and third floor respectively with uniform storey stiffness of 500 kN/m at each floor. Calculate natural frequency and corresponding mode shapes for the fundamental mode only. Also draw mode shapes **14**
- Q.4** (a) A small shop having regular hexagonal shape plan with sides of 10m has slab of 180mm thickness. The slab is supported on four consecutive corners by circular columns of diameter 470mm such that, its half part in plan becomes cantilever. The height of slab is 5.2m. Carryout the lateral load distribution as per the relevant IS code, if the recorded acceleration at roof level is 0.20 m/s^2 **07**
 (b) Explain the important points related to the behavior of beams and columns during earthquake **07**
- OR**
- Q.4** (a) A mild steel rod of 1.5m length and 16mm diameter is fixed at one end and free at the other end. A mass of 20kg is displaced by 80mm and released to vibrate at free end. Determine the following **07**
 1. Amplitude after 4 cycles
 2. Number of cycles when amplitude reaches 1 mm.
 Take $C = 21.36 \text{ NS/m}$ and $E = 200 \text{ GPa}$
 (b) Explain the following
 1. Strong ground motion **03**
 2. Richter magnitude scale **04**

- Q.5 (a)** Describe importance of ductile detailing and explain factors affecting the ductility of structures in detail. Also explain ductile detailing of beam – column joint as per IS 13920 – 1993 **07**
- (b)** Enlist various softwares used for dynamic analysis. Explain the important features of any two in brief **07**

OR

- Q.5 (a)** Explain various methods of dynamic analysis. Explain Time History Analysis method in detail **07**
- (b)** Explain the causes and remedial measures of liquefaction **07**

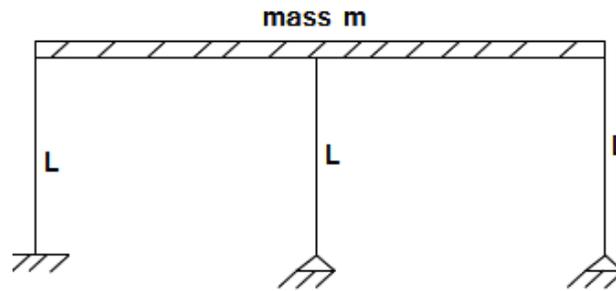


FIGURE - I
