# GANPAT UNIVERSITY

## B. Tech. Semester: 7th Civil Engineering

### Regular Examination November – December 2014

### 2CI708 Elective Paper –I (Design of Earthquake Resistant Structures - I)

**Time: 3 Hours**　　　　　　　　　　　　　　　　　　　　　　　**Total Marks: 70**

**Instruction:**　1. All Questions are Compulsory.
　　　　　　　　2. Draw Sketches/ Figures wherever necessary which indicates full marks.
　　　　　　　　3. IS 1893-2002 is allowed.

## Section - I

| | | |
|---|---|---|
| **Que. – 1** | **Attempt Following question.** | **12** |

(A) Define tectonic plates. Write short note on plate boundaries.

(B) Derive the equation for the single degree of free-damped vibration system.

(C) Find centre of mass for figure 1 and centre of stiffness for system shown in figure 2 having all the columns and beams of same cross section.

**OR**

| | | |
|---|---|---|
| **Que. – 1** | **Attempt Following question.** | **12** |

(A) Write short note on Earth interior.

(B) Differentiate between magnitude and intensity.

(C) Explain Under damped system, critically damped and Over damped system with example.

**Que. – 2　Attempt Following question.**

(A) A spring mass model consists of 8 kg mass and spring with stiffness 6 N/mm, was tested for viscous damped vibration. Test recorded two successive amplitudes 3 and 2 Determine the natural frequency of undamped system, the logarithmic decrement, damping ratio, damping coefficient, damped natural period.　**05**

(B) Set up the equation of motion for the following damped SDOF system without external force and solve for the response under given condition. K=324 N/m, m= 4 kg, c= 4 N-s/m, x(0)=1 and $\overset{o}{x}(0)$=8.5.　**06**

**OR**

**Que. – 2　Attempt Following question.**

(A) For a single degree of critically damped system set up the equation of motion for the following condition. Mass= 40 kg, Stiffness=20 kN/m. Initial displacement and velocity 6 cm and 0 m/s respectively.　**05**

(B) A water tank having lumped mass of 10 kN at top is 10 m long. The shaft of the tank has diameter 2 m with wall thickness 300 mm. The tank is subjected to harmonic force of 3 kN amplitude and 25 rad/sec frequency. Find the maximum dynamic displacement if damping is 5% of critical.　**06**

**Que. – 3　Attempt Following question.**　**12**

(A) Define Logarithmic decrement, how it is measured and derive the equation of Logarithmic decrement.

(B) Write short note on Rigid Diaphragm effect.

(C) Define mathematical Model. Give the equation of force damped vibration. Draw mathematical model for two storey building and also draw free body diagram for the same.

**Que. – 4** For a Three storey building frame draw the mode shapes for fundamental modes only. Also find total weight contribution in each mode for the following data. Mass of first, second and third storey is 5000 kg, 5000 kg and 4000 kg respectively. Similarly stiffness is 400 kN/m for all storey. Height of each storey is 3 m. **12**

**OR**

**Que. – 4** For a five storey Steel framed railway station building with concentric bracing and without infill wall, find the seismic base shear, using equivalent lateral load method. Consider following data. **(i)** Location : Bhuj **(ii)** Soil condition : Medium soil **(iii)** Plan dimensions : 3 bays of 4 m each along X direction and 4 bays of 3 m each along Y direction. The intensity of dead load including column, beam and slab is 12 $kN/m^2$. Consider Live load on floor 3 $kN/m^2$. Consider 20 % damping. Height of floor is 3m. Also plot lateral load distribution diagram. **12**

**Que. – 5** **Attempt Following question.**
   (A) Differentiate between soft storey and weak storey. **03**
   (B) Explain Elastic Rebound Theory. **04**
   (C) Write short note on Peak ground acceleration. **04**

**OR**

**Que. – 5** **Attempt Following question.**
   (A) Explain short column effect in detail with sketch in detail, **03**
   (B) Explain factors affecting liquefaction in detail. **04**
   (C) Give name of any two past Indian earthquakes with its consequences. **04**

**Que. – 6** **Attempt Following question.** **12**
   (A) Explain importance of vertical reinforcement and bands in masonry structures with neat sketch.
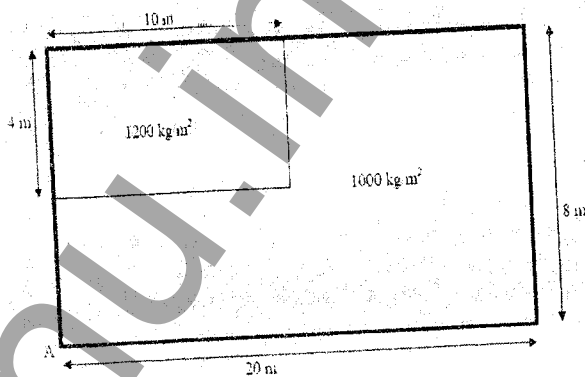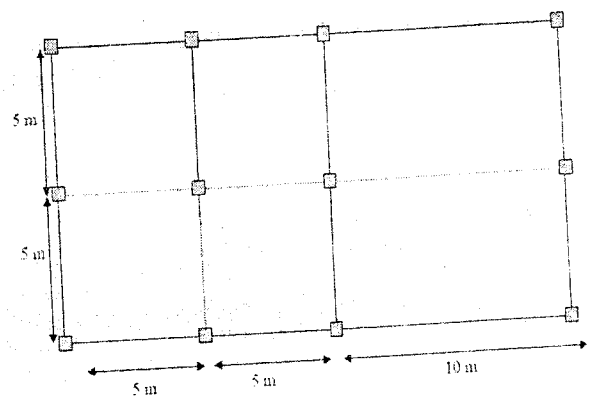   (B) Explain vertical and horizontal irregularities in building with neat sketch.



Figure : 1



Figure:2

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