B.TECH SEM – VIII (2007 COURSE) (CIVIL ENGG.) :

**WINTER - 2017**

**SUBJECT: EARTHQUAKE ENGINEERING & DISASTER MANAGEMENT**

Day: **Monday** Time: **02.30 PM TO 05.30 PM**

Date: **20/11/2017** **W-2017-2648** Max. Marks: 80

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**N.B.:**

1) **Q. No. 1 and Q. No. 5** are **COMPULSORY.** Out of the remaining attempt any **TWO** questions from each section.
2) Figures to the right indicate **FULL** marks.
3) Answers to both the sections should be written in **SEPARATE** answer book.
4) Use of non programmable **CALCULATOR** is allowed.
5) Assume suitable data if necessary.
6) Use of I.S. 1893 part -I 2002 and I.S. 13920-1993 is allowed.

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## SECTION-I

**Q.1** **a)** Define Liquefaction of soil. How on occurrence of an earthquake induces liquefaction? How it can be reduced? **(05)**

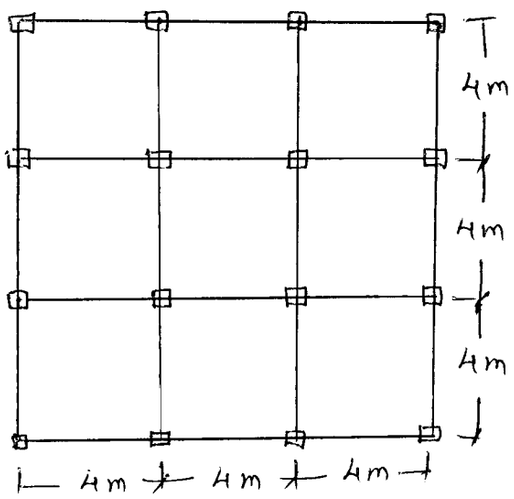
**b)** What is damping? What is its importance in earthquake resistant design? **(05)**

**c)** What is a 'Seismograph'? How it is useful in determining seismic design forces? **(04)**

**Q.2** **a)** Write the causes of an earthquake with the help of " plate tectonic". **(07)**

**b)** Describe briefly the direct and indirect effects of an earthquake. **(06)**

**Q.3** A three storied SMRF building has plan dimensions as shown in figure. The storey height is 3.1m. The dead load / unit area of the floor consisting of floor slabs and finishes is 4 kN/$m^2$. The intensity of live load on each floor is 3kN/$m^2$ and that on the roof is 1.5kN/$m^2$ .Sizes of all beams and columns are 300mm×450mm. The building is located at Kolkata and soil below the foundation is hard. Determine the seismic forces and shears at different floor levels using Equivalent Static method. **(13)**

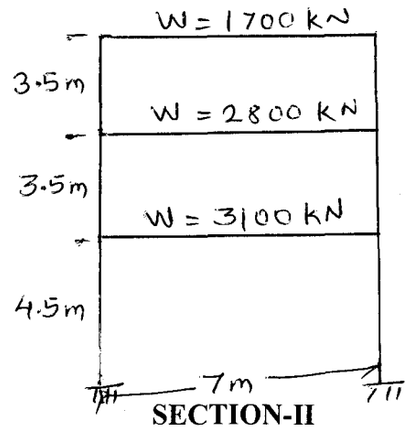



**P. T. O.**

**Q.4** For the frame shown in figure with seismic weights as shown, determine the seismic design forces using dynamic analysis and show the distribution of lateral forces with height. The free vibration properties of the building are as follows:

| Floor Level | Mode 1<br>T = 0.44sec | Mode 2<br>T = 0.21sec | Mode 3<br>T = 0.141sec |
|---|---|---|---|
| 3 | 1.0 | 1.0 | 1.0 |
| 2 | 0.66 | -0.59 | -2.39 |
| 1 | 0.31 | -0.64 | + 2.42 |

The base shear as determined by static analysis is 472 kN. Given Z = 0.24 I = 1.5 R =5.




**SECTION-II**

**Q.5** **a)** What is HVRC assessment of Earthquake? **(05)**

**b)** What is a 'Strong column- weak beam' concept? **(05)**

**c)** Write the main concerns in the joints of a frame of a RCC building? What care needs to be taken to overcome these concerns? **(04)**

**Q.6** **a)** What do you understand by 'Disaster Mitigation'? How it is achieved? **(06)**

**b)** What are Tsunamis? How they are caused and how they are predicted? **(07)**

**Q.7** Design a shear wall of length 4.5 m and thickness 250mm subjected to following forces .Use M 25 . Fe 415. **(13)**

| Loading | Axial force (kN) | Moment (kN m) | Shear (kN) |
|---|---|---|---|
| DL + LL | 1900 | 400 | 25 |
| EQ load | 400 | 4200 | 580 |

**Q.8** **a)** 'The architect and the structural engineer must co-ordinate at the planning stage of an earthquake resistance building'. Discuss the statement. **(07)**

**b)** Using diagrams describe how the irregularities of mass, strength occur in a building? How do they affect the building? **(06)**

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