Total No. of Questions :12]

SEAT No. :

P3938

[Total No. of Pages :4

[4959] - 12

B. E. (Civil)

EARTHQUAKE ENGINEERING

(2008 Course) (Elective - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***From Section I answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6 and from Section II answer Q.7 or Q.8; Q.9 or Q.10; Q.11 or Q.12.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right, indicate full marks.***
4) ***IS 456, IS 1893, IS 13920 are allowed in the examination.***
5) ***Neat diagrams should be drawn where ever necessary.***
6) ***If necessary, assume suitable data and indicate clearly.***
7) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are the causes of an earthquake? Explain with neat sketches the Elastic Rebound Theory? **[6]**

b) Classify and describe with suitable sketches, different types of waves generated by an earthquake? **[4]**

c) Explain philosophy behind earthquake resistant design of structures? Describe the difference between magnitude and intensity of an earthquake? **[6]**

OR

Q2) a) Explain with examples, the lessons learnt from past earthquakes? **[8]**

b) Explain the interior of the earth with neat sketches? Classify the earthquakes based on different parameters? **[8]**

P.T.O.

Q3) a) What are different types of vibrations? Define natural frequency, Natural time period, Natural circular frequency and Damping ratio. **[8]**

b) Explain with examples, Over damped system, critically Damped system and Under damped system giving example of each for free but damped SDOF. **[8]**

OR

Q4) For the two degree freedom system shown in Figure 4.1, obtain natural frequencies and amplitude ratios. Assume K = 20kN/m. **[16]**

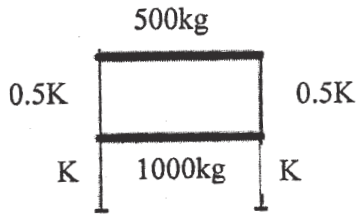

Figure 4.1

Q5) Determine the design eccentricity in Y-direction for a three storey building as shown in Figure 5.1. The total seismic weight /floor=450kN. The column size = 400mm × 600 mm. Assume grade of concrete = M25. **[18]**

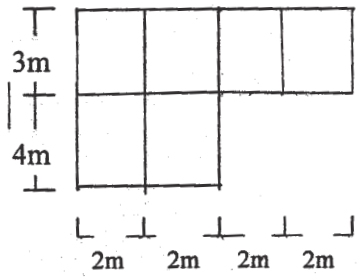

Figure 5.1

OR

Q6) Determine lateral forces at different storey levels for a plan of four storey school building as shown in Figure 6.1. Assume D.L. = 5kN/m^2, L.L = 4kN/m^2 on each floor and 1.5 kN/m^2 on roof. Assume floor height 4m for ground and 3m for remaining storey with soil type hard and seismic zone III. **[18]**

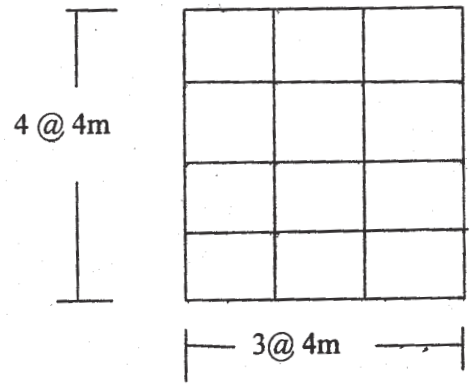

Figure 6.1

SECTION - II

Q7) a) What is the necessity of ductile detailing? Explain with neat sketches the detailing for Beam-Column joint as per IS 13920 (1993). **[9]**

b) Explain the effects and various methods to reduce the effects of liquefaction of soil? **[9]**

OR

Q8) a) Define the shear wall and its classification? Describe the structural behavior of shear wall? **[9]**

b) What is Base Isolation? Explain energy dissipation devices to improve earthquake resistance of buildings? **[9]**

Q9) a) What is strengthening and retrofitting? Explain in brief the techniques for retrofitting of RCC build constructions? **[8]**

b) Explain the terms active and passive control system? What are different types of steel frames used in earthquake prone areas? **[8]**

OR

Q10)a) Explain Tuned Mass Dampers? **[8]**

b) Explain various techniques for local retrofitting of RC buildings? Give reasons for poor performance of masonry buildings? **[8]**

Q11)a) Differentiate between retrofitting and strengthening? What are techniques for retrofitting of RC buildings? **[8]**

b) A 400 mm × 600 mm column is reinforced with14 nos. of 16mm dia. Bars. It is supported on an isolated footing. The load coming on footing is1600kN and a moment 30kN.m. The SBC is 150kN/m^2. Using M25 grade of concrete and steel grade Fe500, design footing and sketch the details. **[8]**

OR

Q12) Write notes on- **[16]**

a) Factors Controlling liquefaction.

b) Irregularities in buildings

c) Response spectrum analysis

d) Load Resisting systems as per IS13920