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B.E. (Civil Engineering) (Part-I) (Semester-VII) (New)**Examination, May - 2016****EARTHQUAKE ENGINEERING****Sub. Code: 47903**

Day and Date : Monday, 02-05 - 2016

Total Marks : 100

Time : 3.00 p.m. to 6.00 p.m.

- Instructions :**
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicates full marks.
 - 3) Assume any suitable data whenever necessary.
 - 4) Use of non-programmable calculator and I.S. 1893: 2002 (Part I) are allowed.

SECTION-I

- Q1) a)** What are plate tectonics and how are they related to continental drift and sea floor spreading? [6]
- b) Differentiate magnitude and intensity on an earthquake. [6]
- c) Classify different types of earthquake. [5]
- Q2) a)** Derive the equation of motion and its solution for forced undamped vibration system. [8]
- b) A SDOF vibrating system is having following parameters.
 $m = 200 \text{ kg}$, $k = 160 \text{ N/m}$, $c = 40 \text{ N-sec / m}$. Determine: [8]
- i) The damping factor.
 - ii) The natural frequency of damped vibration.

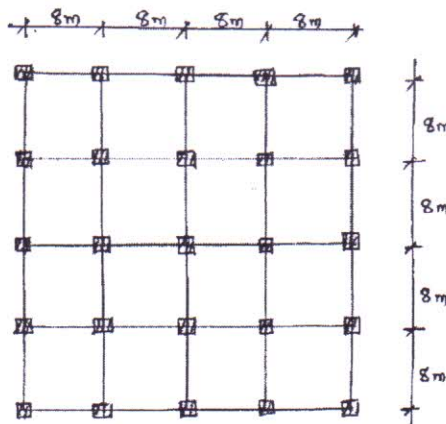
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- iii) Logarithmic decrement.
- iv) The ratio of two successive amplitudes &
- v) The number of cycles after which the original amplitude is reduced to 50%.

Q3) a) Explain the phenomenon of resonance. [5]

b) A SDOF system consists of 5m high column of 300 mm diameter which supports the heavy mass of 20 tonne at its top. The system is subjected to a harmonic force of $200 \sin 50t$ kN. Consider 20% damping & $E = 2.1 \times 10^5$ N/mm². Calculate the maximum dynamic amplitude. Also state whether system will have resonance or not? [12]

Q4) a) A four storied square RC framed building shown in Fig. 1 with live load 4 kN/m² is to be constructed in Pune. Work out seismic forces on the structure by seismic coefficient method using IS 1893. All beams and columns size 300mm × 400mm. Thickness of roof and floor slab 120mm thick. Wall is of 150 mm thick all around. Height of each floor 3m. Density of concrete 25 kN/m³. [17]



SECTION-II

Q5) a) Philosophy of Earthquake Resistant Design. Give four virtue of good earthquake resistant design. [9]

b) Explain phenomena liquefaction and write remedial action taken to avoid liquefaction effect? [8]

- Q6)** a) Explain concept of ductile detailing & explain factor affecting the ductility of structures in detail. **[8]**
- b) Explain the ductility requirement considerations in the earthquake resistant design of the following with the help of neat sketches. **[9]**
- i) Flexural members.
 - ii) Joints of frames.
 - iii) Column foundation.
- Q7)** a) Discuss the effects of openings on the performance of masonry walls, under lateral shaking due to earthquakes. **[8]**
- b) Describe the construction procedure and precautions to be taken for brick-nogged timber frame construction. **[9]**
- Q8)** Write a short note (Any Three): **[16]**
- a) Strengthening of masonry walls.
 - b) Bond between reinforcing bars and concrete.
 - c) Strong column and weak beam.
 - d) Jacketing of column.

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