Code No: **R41015** **R10** **Set No. 1**

IV B.Tech I Semester supplementary Examinations, November - 2016

EARTHQUAKE RESISTANT DESIGN

(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

Note: Use of IS 1893-2002, IS 456-2000, IS 13920 – 1993 & IS 4326-1993, is allowed.

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1 a) What do you understand by Intensity of earthquake? Explain briefly different types of scales used to measure the intensity of earthquake. [8]

b) Define earthquake size and write detailed classification of earthquakes. [7]

2 An SDF system is excited by a sinusoidal force. At resonance the amplitude of displacement was measured to be 65 mm. At an exciting frequency of one tenth the natural frequency of the system, the displacement amplitude was measured to be 4 mm. Estimate the damping ratio of the system. [15]

3 Determine the natural frequencies of vibration and corresponding mode shapes for a three storied building having lumped floor masses and storey stiffnesses (Top to Bottom) as follows:

$m_1 = 0.47$ kN sec^2/mm; $m_2 = 0.39$ kN sec^2/mm; $m_3 = 0.44$ kN sec^2/mm

$k_1 = 89$ kN / mm; $k_2 = 185$ kN / mm; $k_3 = 215$ kN / mm [15]

4 a) Analyze the two bay two storeys RC frame by any appropriate approximate method of analysis. Lateral force of 120 kN & 80 kN is acting at first & second floor respectively. Storey height = 3 m & bay width of each bay = 4 m. Draw axial force, shear force & bending moment diagram. [8]

b) Derive expression for the free vibration response of damped SDOF structural system & differentiate the response with that of free un-damped response. [7]

5 a) What is a seismic code? How do they help us in designing structures? [8]

b) Distinguish between seismic coefficient and response spectrum methods. [7]

6 a) Write the code provisions for ductile detailing of beams and columns. [8]

b) Explain Nine principles to be observed in construction of earthquake resistant buildings as per IS 4326-1993. [7]

7 a) What are the various types of irregularities? Explain the different types of horizontal irregularities, with sketches. [8]

b) On what basis minimum width of gap is provided between adjoining structures to ensure proper separation? Show by a sketch, from what level the separation is essential to ensure prevention of knocking. [7]

8 A rectangular shear wall is of size 350 mm × 5000 mm. It is subjected to a factored axial load of 4200 kN and a factored moment of 4600 kNm. Design and detail the shear wall as per IS 13920. Use Fe 415 steel and M 30 concrete. [15]