Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015

Subject code: 711502N **Date: 09/12/2015**

Subject Name: Structural Dynamics and Earthquake Engineering

Time: 10:30 AM to 1:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS 1893 – 2002 and IS 13920 – 1993 is permitted.**

Q.1	**(a)**	Calculate base shear for the 10 story R.C. frame building for hospital located in Bhuj, using seismic coefficient method for the following data 1. No. of bays in X ï direction - 8 2. No. of bays in Y ï direction - 6 3. Bay width in both direction ï 4 m 4. Story height - 4 m 5. Thickness of Slab - 175 mm 6. Size of web of Beam - 230 mm x 460 mm 7. Size of Column - 460 mm x 600 mm 8. Internal wall thickness - 115 mm 9. Internal wall thickness - 230 mm 10. Live Load - 4 kN/m^2 Assume suitable data if required. Give your calculation with appropriate clause number of code and draw shear distribution at each floor level.	**14**
Q.2	**(a)**	Explain various methods of dynamic analysis. Explain Time History Analysis method in detail.	**07**
	(b)	Find the natural frequency of the system shown in the fig.1.	**07**
		OR	
	(b)	Describe seismic waves briefly.	**07**
Q.3	**(a)**	How flexibility of buildings affects their earthquake response?	**07**
	(b)	Explain the importance of horizontal bands in masonry buildings?	**07**
		OR	
Q.3	**(a)**	A three story building frame with uniform floor height of 3.5m is having lumped masses of 4 tonns, 3 tonns and 2 tonns at first, second and third floor respectively with uniform storey stiffness of 600 kN/m at each floor. Calculate natural frequency and corresponding mode shapes for the fundamental mode only. Also draw mode shapes.	**07**
Q.4	**(a)**	Derive expression for the response of SDOF forced damped structural system.	**07**
	(b)	Give details of expected damages by Earthquake in structures with i) Soft storey ii) Floating columns iii) Unsymmetrical plan iv) Building frams without shear panels	**07**
		OR	

Q.4	**(a)**	Find the natural frequency and natural period for the building frame shown in the fig.2. During test the frame is given 50 mm initial lateral displacement and released from the rest to vibrate freely. Find the displacement after 5 seconds and number of cycles when amplitude reduced to $1/10^{th}$ of maximum. Consider 10% damping. Take $EI_{column} = 1.5 \times 10^{12}$ Nmm, $EI_{beam} = Ð$.	**07**
	(b)	Explain the effect of earthquake on the buildings having structural irregularities.	**07**
Q.5	**(a)**	Describe concept of ductile detailing & explain factors affecting the ductility of structures in detail. Also explain ductile detailing of beam ï column joint as per IS 13920 ï 1993.	**07**
	(b)	Explain the important features of ANSYS software. How this will differentiate with STAAD software?	**07**
		OR	
Q.5	**(a)**	Equation of motion of SDOF system is given by 10Xęę+5Xę+20X = 12 sin ɤ t. Calculate the following 1.Damping factor 2. Damped Frequency 3.Critical damping 4.Amplitude at resonance 5. Magnification factor 6. Logarithmic decrement	**07**
	(b)	Define liquefaction and explain the causes and remedial measures of liquefaction.	**07**

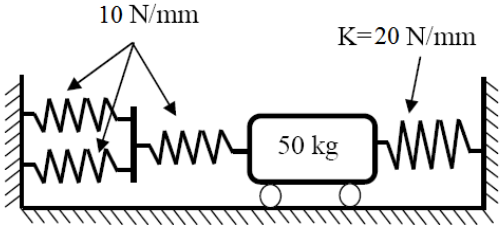

FIGURE - I Q - 2 (b)

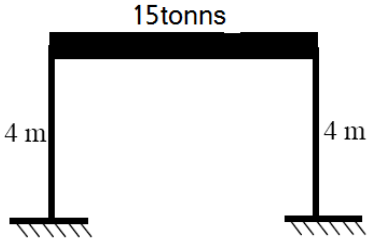

FIGURE - II Q-4(a) OR

****