Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–V EXAMINATION – WINTER 2015

Subject Code: X50602 **Date:12/12/2015**

Subject Name: Earthquake Engineering

Time: 10:30pm to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **IS 13920, IS 1893, IS 4326 are allowed in the examination.**

Q-1	(a)	Answer the following 1. How will you calculate the stiffness force in a column? 2. What are the three factors on which the behavior of a building depends critically during Earthquakes? 3. Which Indian code will you use while designing buildings for twist? 4. In seismic design of buildings which failure should be avoided? 5. Why are reinforcing steel bars used in masonry and concrete construction? 6. Which Indian code will you use to ensure ductility in design? 7. This code has been made mandatory for all the structures in Zone III, IV and V after the 2001 Bhuj earthquake. Name it.	07
	(b)	1. What is mathematical model? Explain mathematical Model with suitable example.	04
		2. Differentiate between free vibrations and Forced Vibrations	03
Q-2	(a)	A spring mass model consist of 6 kg mass and spring with stiffness 3.6 N/mm, was tested for viscous damped vibration. Test recorded two successive amplitude1.5 and 1.25. Determine: (i) The natural frequency of undamped system (ii) The logarithmic decrement (iii) Damping ratio (iv) Damping coefficient (v) Damped natural period	07
	(b)	Derive an equation of motion for SDF Undamped Vibration system	07
		OR	
	(b)	Derive an equation of motion for free damped vibration of SDF system	07
Q-3	(a)	A machine weighting 113.64 kg is mounted on a support system consisting of four springs and four dampers. The vertical deflection under the weight of machine is 2.03 cm. the damper are designed to reduce the amplitude of vertical vibration to 1/8 th of the initial amplitude after two complete cycles of free vibration. Find: (a) undamped natural frequency (b) damping ratio	07

(c)Damped natural frequency.

	(b)	Define: - (i) Isoseismal (ii) homoseismal (iii) meisosesmal (iv) seismicity (v) seismogram (vi) seismoscope. (vii) Seismometer	07

OR

Q-3	(a)	Determine the magnification factor of forced vibration produced by an oscillator fixed at the middle of the beam at a speed of 610 rpm. The weight concentrated at the middle if the beam is w=5000 N and produces a static deflection of the beam equal to0.025 cm assume damping coefficient is 20N-S/mm	07
	(b)	Define :- (i) magnitude (ii0 Richter magnitude Scale (iii) surface wave magnitude (iv) body wave magnitude (v) moment magnitude (vi) Duration magnitude (vii) Intensity	07
Q-4	(a)	Discuss provision of horizontal Reinforcement in masonry walls as per IS 4326:1993	07
	(b)	For the two storey building having lumped masses m_1= 4000 kg, m_2= 3000 kg, and having storey stiffness k_1= 4 x 10^5N/m, k_2= 3 x 10^5 N/m. perform free vibration analysis and draw all mode shape	07

OR

Q-4	(a)	A five storey building has size of 30 m x 30 m. it is located in Bhuj and resting n hard soil. The weights of the floors are 2000KN, 2500 KN, 2500KN and 2100KN and 4.5 m, 3.6m, 3.6 m,3.6 m, and 3.6m respectively from slab no 1 from bottom. Calculate the horizontal shear forces acting at the each slab level by equivalent lateral force method. Assume the building as special moment resisting office building.	08
	(b)	Write on 1.Difference between Centre of mass and Centre of stiffness 2.Difference between torsion ally coupled and torsionally uncoupled system	06
Q-5	(a)	Explain ductile Detailing of column as per IS: 13920: 1993	07
	(b)	What do you mean by structural control? Explain Active and passive control	07

OR

Q-5	(a)	Analyzes the two bay two storeys RC frame by any approximate method of analysis. Lateral force of 100 KN and 70 KN is acting at first and second floor respectively, storey height = 3.2 m and bay width of each bay = 4.5 m, draw Axial force diagram, shear force and bending moment diagram	07
	(b)	Explain Repair, Restoration and Retrofitting.	07