Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 711502N **Date: 17-06-2014**

Subject Name: Structural Dynamics & Earthquake Engineering

Time: 02:30 pm - 05:00 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 relevant IS 456 and SP 16 are permitted.**

Q.1	**(a)**	A propped cantilever beam having mass of 125kg/m and flexural rigidity 25kN-m^2. If the beam is pulled down by 12mm at the center and then released, derive the equation of motion.	**07**
	(b)	Write a short note on Duhamelôs integral.	**07**
Q.2	**(a)**	A simply supported beam is having a span of 12m and is having flexural rigidity 25000 kN-m^2. A rotating pump of weight 12kN is placed at the center of beam. The unbalanced mass 100kg rotates at 2000rpm at an eccentricity of 150mm. The damping ratio of beam is 0.06. Derive the equation of steady state condition from the basic differential equation.	**07**
	(b)	A single spring has 1200kg mass, spring constant 1.2 x 10^6 N/m and viscous damper constant of 3500 N-sec/m. This spring mass system is having initial displacement and velocity of 0.015m and 2.5m/sec. derive the response of the mass from the basic fundamentals. Calculate the time required to reduce the initial amplitude to 5% of the original amplitude.	**07**
		OR	
	(b)	What do understand by damped free vibration system? Explain in detail with example.	**07**
Q.3	**(a)**	Discuss the term Logarithmic decrement. Where is it used in dynamics?	**06**
	(b)	Describe various steps involved in model analysis of a multistoried building.	**08**
		OR	
Q.3	**(a)**	When do we use lumped mass approach in structural analysis? Explain its usage in analysis of elevated water tanks.	**05**
	(b)	What is a shear building? Explain it with figures. Why word shear is used here?	**06**
	(c)	What do you understand by under-damped, over-damped and critically- damped vibrations?	**03**
Q.4	**(a)**	What do you mean by spectrum analysis of structure? Explain steps involved in spectrum analysis. What are its limitations?	**07**
	(b)	Explain principal underlying ñStrong column- weak beamò theory.	**04**
	(c)	Enlist various methods which can be employed to safeguard high rise buildings against earthquake.	**03**
		OR	
Q.4	**(a)**	Explain seismic coefficient method of analysis of structure. Write its advantages and disadvantages.	**07**
	(b)	In how many seismic zones, India is divided? What is the basis of seismic zoning?	**04**

(c) What do you understand by push-over analysis? When do we apply in analysis? **03**

Q.5 Write an short note (Attempt any three) **14**

(a) Liquefaction of soil
(b) Reinforcement details of beams as per IS 13290
(c) Reinforcement details of column as per IS 13290
(d) Structural irregularities
(e) Earthquake resistant measure in masonry
(f) Intensity and magnitude of earthquake