Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- IVth SEMESTER–EXAMINATION – SUMMER- 2017

Subject Code: 2742003 **Date:03/05/ 2017**

Subject Name: Advanced Seismic Design of Structures

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1	(a)	Enlist various earthquake parameters to be used as seismic input giving suitability and limitations of each.	**07**
	(b)	Explain power spectral density function and Fourier amplitude spectrum giving example.	**07**
Q.2	(a)	What is D-V-A spectrum? Why are V and A known as "Pseudo" spectra? Write steps to construct D-V-A.	**07**
	(b)	A water tank container of 5 lacs litre capacity is supported on RCC cylindrical shaft having 25 m height. Self weight of container is 200 kN. Shaft wall has 200 mm thickness and 10 m external diameter. Determine (i) natural frequency and natural period of the system (ii) Peak deflection and bending stress due to El, Centro ground motion (tripod spectra is shown in fig.1 for 0,2,5,10 & 20 % damping) considering single degree freedom system.Asssume M30 concrete and fe415 steel. Neglect weight of shaft. Assume suitable damping level.Coment on the result.	**07**
		OR	
Q-2	(a)	Why do we design structure with Inelastic Response in case of seismic resistance design? Differentiate Elastic Response & Inelastic Response of a structure.	**07**
	(b)	Differentiate design spectra and response spectra. Explain how a design spectrum is constructed.	**07**
Q-3		For the system shown in the fig.2.determine the mass and stiffness matrices and the corresponding influence coefficient vectors. Consider uniform mass distribution. Stiffness of all columns is same along both the directions.	**14**
		OR	
Q-3	(a)	For the system shown in the fig.3.determine the stiffness matrix and the corresponding influence coefficient vectors. Consider uniform mass distribution. Stiffness of all columns is same along both the directions.	**07**
	(b)	What is multi support excitation? Give examples of civil engineering structures in which multi-support excitation are to be consider in seismic analysis. Find the “r” matrix for the frame shown in Fig.4.	**07**
Q-4	(a)	Explain performance-based seismic design.	**07**
	(b)	What is capacity design? A beam framing on a column has been design for 150 kNm working moment. Column is also carrying 1500kN working axial load. Suggest capacity design forces to be consider for the column and footing design.	**07**
		OR	

Q-4 (a) Enlist the possible brittle failure modes in RCC structure and explain in details the preventive measures to prevent/control them. **07**

(b) What is meant by direct integration methods? List at least four direct integration methods and state whether it is implicit or explicit. **07**

Q-5 (a) What is pushover Analysis? Differentiate between force controlled and displacement controlled pushover analysis. **07**

(b) Explain meaning of soil structure interaction with respect to seismic response. Differentiate kinematic and inertial interaction. **07**

OR

Q-5 (a) What is soil-structure interaction? Enlist and explain different approaches/methods for soil-structure interaction problems with illustrative sketches. Give limitations of methods. **14**

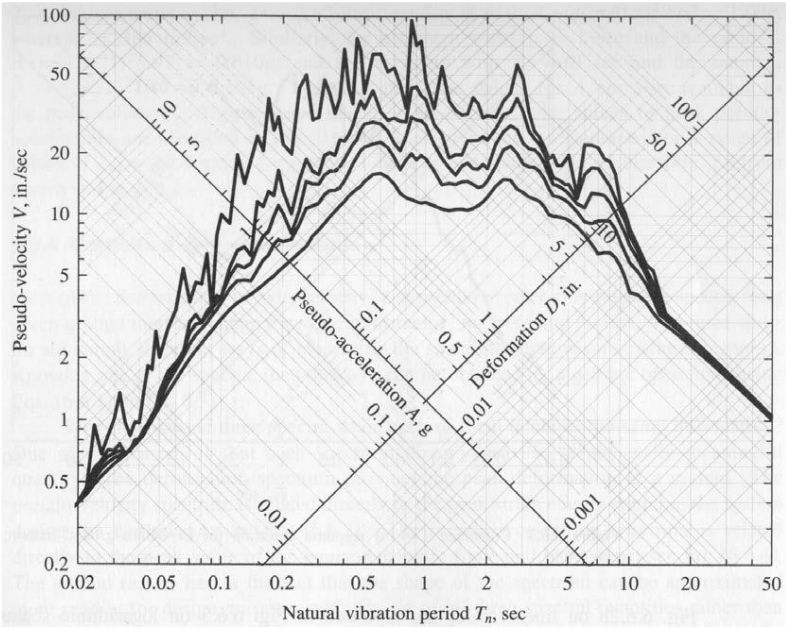

Fig.1

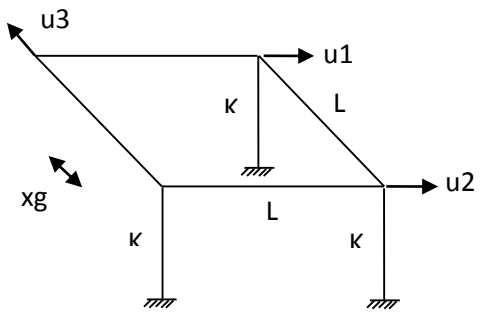

Fig.2

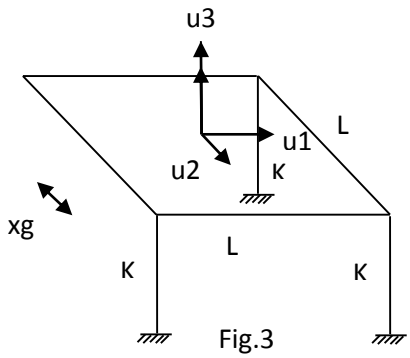

Fig.3

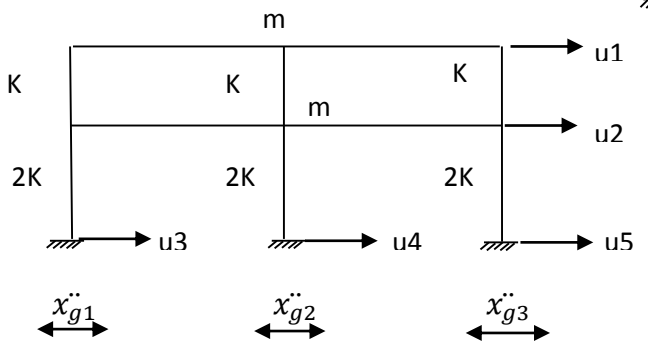

Fig.4