Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**ME – SEMESTER IV (NEW) – • EXAMINATION – WINTER 2016**

**Subject Code: 2742003** **Date: 26/10/2016**

**Subject Name: Advanced Seismic Design of Structures**

**Time:02:30 pm to 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.**

| | | | |
|---|---|---|---|
| Q.1 | (a) | Enlist various earthquake parameters to be used as seismic input. Explain Time History Input. | **07** |
| | (b) | Differentiate PSDF and Fourier amplitude spectrum? | **07** |
| Q.2 | (a) | Explain Probabilistic and Uniform Hazard Spectrums design response spectra. | **07** |
| | (b) | A 8 m long steel pole supports 1000 kg mass attached at its top as shown in the fig.1.Determine (i) natural frequency and natural period of the system (ii) Peak deflection and bending stress due to El,Centro ground motion as shown in tripod spectra (fig.2) for 0,2,5,10 & 20 % damping).Neglect weight of pipe. Take external dia.of pipe =160 mm, Internal dia. =144 mm. Assume suitable damping level. | **07** |
| | | OR | |
| Q-2 | (a) | Differentiate between Elastic Response and Inelastic Response. | **07** |
| | (b) | What is Predictive Relationships for earthquake parameters? State factors to be consider for it. Write expressions of the predictive function for PGA. | **07** |
| Q-3 | | For the system shown in the fig.3.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.4.determine the stiffness matrix and the corresponding influence coefficient vectors. Stiffness of all columns is same along both the directions. Consider uniform mass distribution. | **07** |
| | (b) | What is multi support excitation? Give example of civil engineering in which multi-support excitation is likely. Find the "r" matrix (influence coefficient matrix) for the frame shown in Fig.5. | **07** |
| Q-4 | (a) | Write short note on performance-based seismic design of structures. | **07** |
| | (b) | Give example of brittle failure modes in RCC structure and explain in details the preventive measures to prevent/control them. | **07** |
| | | OR | |
| Q-4 | (a) | What is capacity design? Explain capacity design of beam, column and footing giving suitable example. | **07** |
| | (b) | Differentiate kinematic and inertial interaction. | **07** |
| Q-5 | (a) | What is pushover Analysis? Differentiate between force controlled and displacement controlled pushover analysis. | **07** |

(b) Explain Direct method for soil- structure interaction problems with illustrative sketches. **07**

OR

Q-5 (a) Enlist methods used for soil-structure interaction problems and explain any one method with illustrative sketches. **07**

(b) Differentiate geometrical and material non linearity with respect to cyclic loading. Write equation of motion for a SDOF and explain the terms. **07**

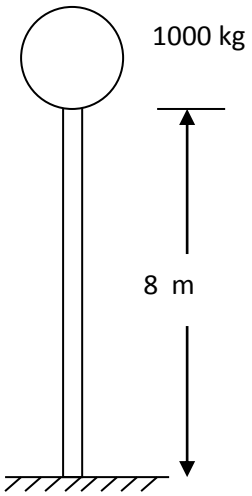


Fig.1

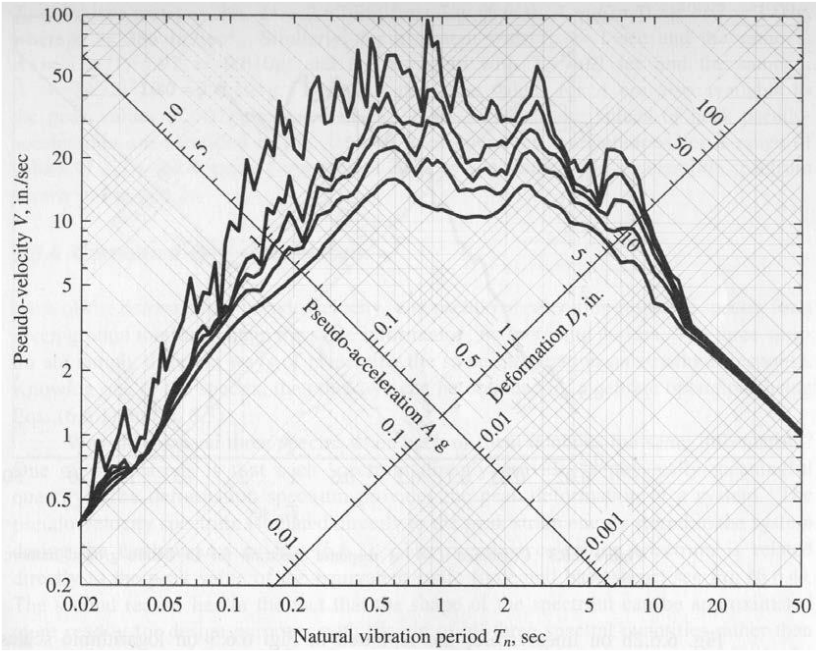


Fig.2

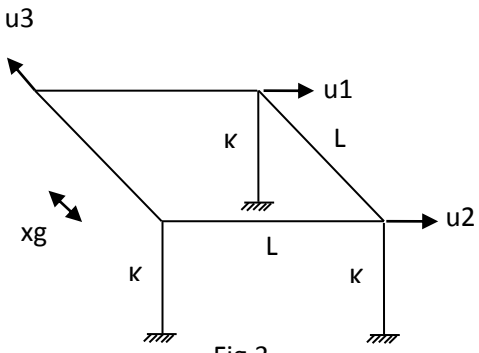


Fig.3

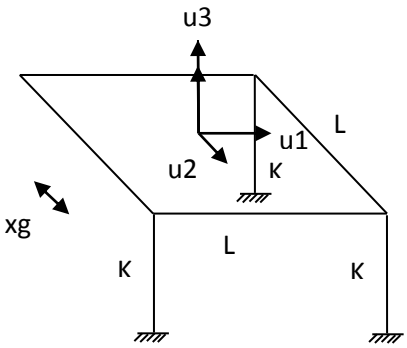


Fig.4

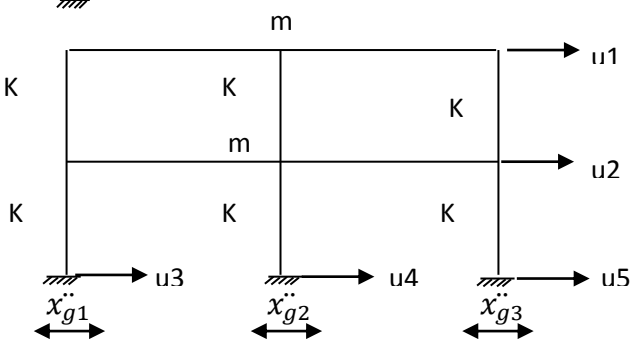


Fig.5