Paper Code: MTST-101/STR-12	Roll No.									

M. TECH.
FIRST SEMESTER EXAMINATION, 2016-17
STRUCTURAL DYNAMICS

[Time: 3 Hours] [Total Marks: 70]

Note: Attempt ALL questions:-

1. Attempt any *two* parts of the following:- **(7x2=14)**

(a) How mathematical modeling done to carry out a dynamic analysis, of a building? What do you understand by lumped mass approach?
(b) What is meant by the focus and epicenter of an earthquake? Name the two kinds of body waves and explain how they differ?
(c) Discuss the idealized single degree of freedom system.

2. Attempt any *two* parts of the following:- **(7x2=14)**

(a) A mass of one kg is suspended by a spring having a stiffness of 600 N/m. the mass is displaced downward frame its equilibrium position by a distance of 0.01 m. (a) find the natural frequency of the system (b) response of the system as a function of time.
(b) A cantilever beam 3 m long support a mass of 500 kg at its upper end. Find the natural frequency and natural period of the system. $E = 2.1 \times 10^6$ kg/cm^2 and $I = 1200$ cm^4.
(c) Derive the expressions for equivalent stiffness for systems having springs in (a) series (b) parallel.

3. Attempt any *two* parts of the following:- **(7x2=14)**

(a) A simply supported rectangular beam has a span of 1.0 m. it is 100 mm wide and 15 mm deep. It is connected at mid span of beam by a linear spring having a stiffness of 200 kg/cm and a mass of 250 kg is attached at the other end of the spring. Determine the natural frequency of the system. $E = 2.1 \times 10^6$ kg/cm^2.
(b) Determine the expressions for damping period and amplitude of a under damped free vibration of single degree of freedom system.
(c) A damper offers resistance 0.1N at a constant velocity 0.05 m/s. the damper is used with a spring of stiffness equal to 15 N/m. determine the damping ratio and frequency of the system when mass of the system is 0.5 kg.

4. Attempt any *two* parts of the following:- **(7x2=14)**

(a) A SDOF spring –mass-damper system is subjected to a harmonic excitation. The amplitude at resonance is found to be 30 mm and 15 mm at a frequency 0.5 times the resonance frequency. Determine the damping ratio.
(b) Derive expression for steady state dynamic response of a two degree of freedom system.
(c) Consider three degree of freedom system with mass m each and stiffness of each floor is k. determine the frequency equation for free vibration.

5. Attempt any *two* parts of the following:- **(7x2=14)**

(a) Explain the Rayleigh's method to determine frequency in the fundamental mode of vibration.
(b) Discuss Stodola's method to determine mode shape of a multi storey framed building.
(c) A simply supported beam with uniformly distributed mass subjected to transverse vibration. Derive the formula to determine natural frequency of the system.