STR-12

Roll No. | | | | | | | | | | |

M. Tech.
(SEM I) ODD SEMESTER EXAMINATION 2015-16
STRUCTURAL DYNAMICS

Time: 3 Hours **Maximum Marks: 100**

Note: **(i)** Attempt ALL questions.
(ii) Marks are indicated against each question.
(iii) Assume any data suitably, if required.

1. Attempt any **TWO** parts of the followings **10x2=20**

(a) Determine natural frequency and natural period of the system consisting of a mass of 100 kg attached to a horizontal cantilever beam through a linear spring k_2. The cantilever beam has thickness of 8 mm and width of 12 mm. $E = 2.1x10^6$ kg/cm^2 , L = 700 mm and k = 10kg/cm.

(b) Define critical damping? Derive expression for critical damping?

(c) A damper offers a resistance of 0.08N at a constant velocity 0.06 m/s. the damper is used with a spring of stiffness 12 N/m. determine the damping ratio and frequency of the system when mass of the system is 0.3 kg.

2. Attempt any **TWO** parts of the followings **10x2=20**

(a) A single degree of freedom system consists of mass 400kg and a spring stiffness of 300kN/m. by testing it was found that a force of 100N produces a relative velocity 12 cm/s. Find (a) damping ratio, (b) damped frequency, (c) logarithmic decrement and ratio of two consecutive amplitudes.

(b) Derive the expression for logarithmic decrement.

(c) Derive the expression for dynamic magnification factor? Show the resonance condition for a SDOF system subjected to a harmonic excitation.

3. Attempt any **TWO** parts of the followings. **10x2=20**

(a) A SDOF system spring mass damper system is subjected to a harmonic excitation. The amplitude at resonance is found to be 27 mm and 12 mm at a frequency 0.6 times the resonance frequency. Determine the damping ratio.

(b) Derive equation for eigenvalue problem and eigenvector for a vibration of three degree freedom system.

(c) Compute natural frequency and modes for a two story shear frame. $EI = 5x10^6$ Nm^2 , mass of each story = $5x10^5$ N , stiffness of each story = $10x10^5$ N/m

4. Attempt any **TWO** parts of the followings **10x2=20**

(a) What are the different numerical techniques to solve multi degree freedom system? Discuss the Rayleigh's method?

(b) Fundamental period and frequency of n degree freedom system is to be determined. Discuss the Holzer's method to solve above problem?

(c) A three story building model, masses are assumed to be lumped at floor level. Masses are assumed to be m and stiffness as k for each floor respectively. Determine the fundamental frequency of the system, used any numerical method.

5. Attempt any **TWO** parts of the followings **10x2=20**

(a) Derive the expression for equation of motion for axial vibration of beam, considering continuous system.

(b) A simply supported beam is subjected to transverse vibrations. Determine the expression for mode shape?

(c) Determine the natural frequency of vibration of a cantilever beam subjected to transverse vibrations.