Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

M.Tech. Summer 2018-19 Examination

Semester: 2 **Date: 08/05 /2019**
Subject Code: 203209153 **Time: 10:30 AM TO 1:00 PM**
Subject Name: Structural Dynamics **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Explain the terms given below **(05)**
1. Mode shapes
2. Natural Time Period
3. Degree of Freedom
4. Dynamic magnification factor
5. Damping ratio

B) Explain the single-degree-of-freedom system and derive equation for undamped free vibration. **(05)**

C) What do you understand by coulomb-damped free vibration? Explain in detail. **(05)**

Q.2 **Answer the following questions**. (Attempt any three) (Each five mark) **(15)**

A) A concrete beam of 10m span is having self-weight of 750 kg/m. The modulus of elasticity of concrete is 22000 N/mm^2. Take moment of inertia of beam as 2.9 x 109 cm^4. Assume that the total weight is lumped at Centre of beam. Find out the frequency of vibration and time period.

B) A structure is modelled as damped oscillator with spring constant as 5315 N/mm and undamped natural frequency as 25 rad/sec. Experimentally it was found that a force of 4500 N produced a relative velocity of 25.4 mm/sec in the damping element. Find: Damping ratio, Damping period, Ratio of two consecutive amplitudes

C) A Lumped system is weighing 200N is maintained on spring system. The total stiffness of spring is 10N/mm and damping is 0.12N.sec/mm. Determine the Damped natural frequencies.

D) Explain half –power bandwidth with suitable figure.

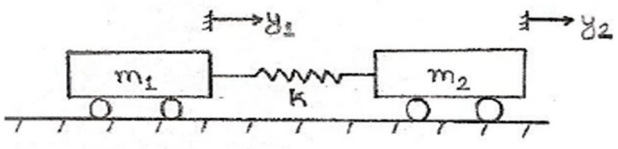
Q.3 A) Derive the equation for undamped forced vibration for single degree of freedom system. **(07)**

B) Write the general equation of motion for Damped Single Degree of freedom system. Explain about under damped and over damped system in detail with relevant figures and formula. **(08)**

OR

B) Derive the equation for damped forced vibration for single degree of freedom system. **(08)**

Q.4 A) A system shown in Figure is modelled by two freely vibrating masses m1 and m2 interconnected by a spring having a constant "k". Determine differential equation of motion for the relative displacement u = y2 – y1 between the two masses for this system. Also determine the corresponding natural frequency of the system. **(07)**



OR

A) A SDOF consist of a mass with a weight of 1740N & spring of stiffness 531.5N/mm. by testing the system it was found that a force of 450N produces relative velocity 304.8mm/sec. Find **(07)**
1) Damping Ratio
2) Damped frequency of vibration
3) Logarithmic decrement
4) Ratio of two consecutive amplitudes

B) Determine the expression for natural frequency and draw the mode shapes for multi-story shear building with free vibration. **(08)**