R09

Code: 9A21702

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013

VIBRATIONS AND STRUCTURAL DYNAMICS

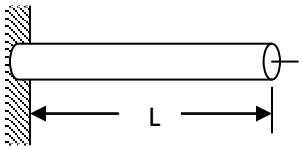
(Aeronautical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

****

1. Find the natural frequencies of vibrations of a simple axial bar of length L dividing into two equal elements of area A and density ρ using lumped mass matrix by FEM approach.

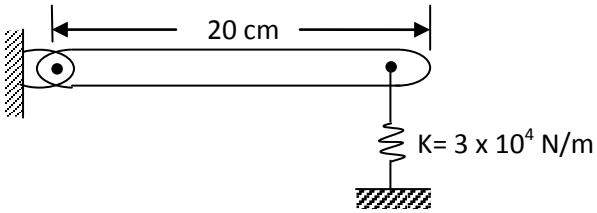


2. The deflection curve of a simple supported beam is represented by y = Y $(\sin \pi x/l) \sin \omega t$. Determine the fundamental frequency of vibration using Releigh's method.

3. The armature of motor weighs 10 N and its C.G. is 0.35 mm off center from the bearing axis. The motor, weighing a total of 40 N, is resting on four springs of stiffness is 140 N/mm each. Find the critical speed of the motor, and the vertical amplitude of vibration of the motor when running at three times this critical speed.

4. (a) Find the Laplace transform of the derivative of a function.
   (b) Determine the response of spring mass damper system to an impulsive input and plot the system response for different amounts of damping.

5. (a) What are the methods of finding natural frequency of vibrating system?
   (b) For the system shown in figure, determine the equivalent stiffness and time period of oscillations.



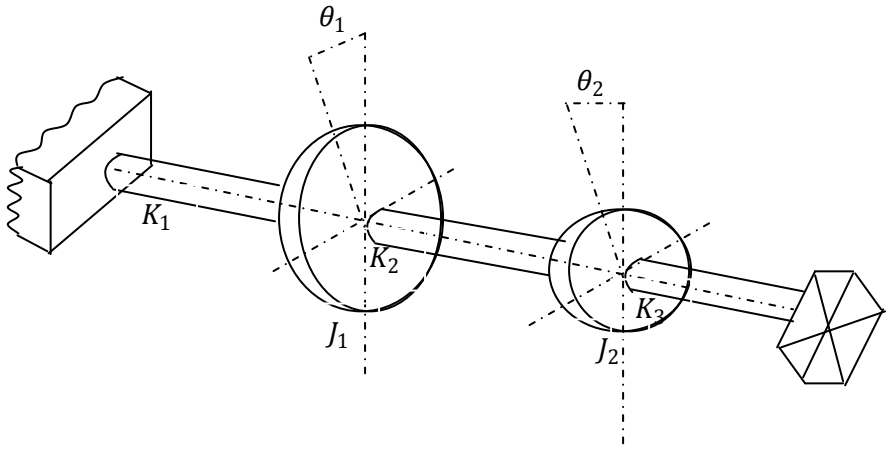
6. A vibrating system having a mass 1 kg is suspended by a spring of stiffness 1000 N/m and it is put to harmonic excitation of 10 N. Assuming viscous damping, c=40 Nsec/m determine
   (a) The resonant frequency
   (b) Amplitude at resonance
   (c) Damped frequency.

Contd. in Page 2

R09

Code: 9A21702

7 For the torsional system shown below, obtain the modes of vibration.



8. (a) Derive the governing equation for continues vibration of a slender axial bar of length L, cross sectional area A and density ρ.
   (b) Derive the solution for wave equation due to continues vibrations.

*****