BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2016-2017

DE G611 DYNAMICS AND VIBRATION

Mid-Semester Examination (Regular) (Closed Book)

Date: 06.10.2016 Maximum Marks: 25 (Weightage 25%) Time: 90 min.

Q1. Describe how logarithmic decrement and coulomb damping methods can be used to find damping co-efficient and co-efficient of friction respectively, by deriving proper equations. **[2]**

Q2. Derive the forced response function for a SDOF mass spring damper system(having Mass M, stiffness K, damping co-efficient C) under rotating unbalance force($me\omega^2$). Where, m is unbalance mass, e is eccentricity and ω is operating speed. Draw the graph between amplitude and frequency ration for different damping ratio. **[2]**

Q3. A 500-kg tumbler has an unbalance of 1.26 kg, 50 cm from its axis of rotation. For what stiffness values of an elastic mounting of damping ratio 0.06 will the tumbler 's steady-state amplitude be less than 2 mm at all speeds between 200 rpm and 600 rpm? **[4]**

Q4. Derive the equations of motion of the system shown in Fig:Q4 using Lagrange's equation. The circular cylinder has a mass ***m*** and radius ***r***, and rolls without slipping inside the circular groove of radius ***R***. **[3]**

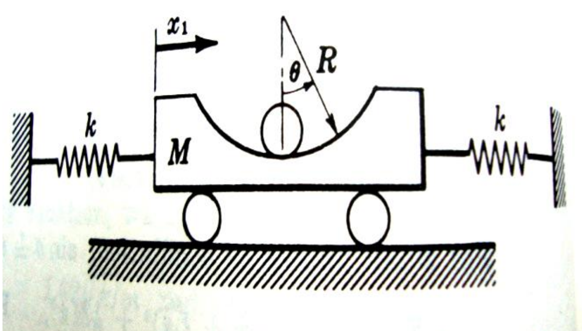

Fig: Q4

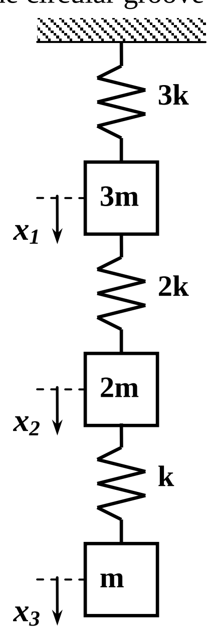

Fig: Q5

Q5. Using matrix iteration method, determine the fundamental frequency and corresponding mode shape of the system shown in Fig.Q5. Also find approximate fundamental frequency by using Rayleigh's method for the system shown in Fig. Q5 **[5+2]**

Q6. Use the Holzer method to determine the natural frequencies and corresponding mode shapes for torsional vibration of the system as shown in Fig.Q6. **[7]**

The data for the torsional system is as follows:

J_1 = 1000 kg-m^2, J_2 = 1500 kg-m^2 , J_3 = 2000 kg-m^2, K_1 = 4×10^5 Nm/rad, K_2 =6×10^5 Nm/rad, K_3 = 8×10^5 Nm/rad.

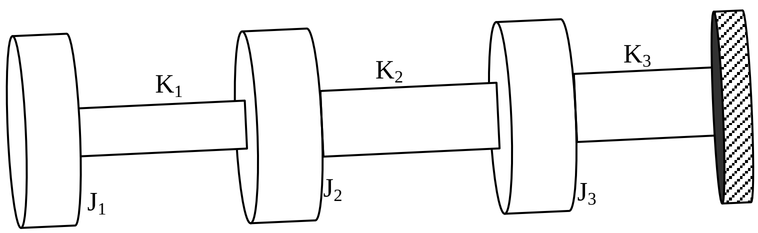

Fig. Q6