بسم الله الرحمن الرحيم

King Abdulaziz University   Mechanical Vibrations
Engineering College   MENG 470
MENG Department   Homework Assignment 2
                     Due Saturday: 2/9/1425 H

From the textbook by S. S. Rao, pp. 178-218

Problem 2.74   Problem 2.75   Problem 2.84

Problem 2.85   Problem 2.88   Problem 2.97

General "mechanical" steps for solving dynamics problems

1. Set up the coordinates and assume all the motions (displacement, velocity, and acceleration) are positive.
2. Identify the geometric or kinematic relationships of various displacements and velocities.
3. Draw free-body diagram with all the forces and moments marked according to the assumption of the motions. For example, damping force is always opposite the velocity, and the spring force is often against the displacement. Pay attention to the internal forces and Newton's third law.
4. Apply Newton's laws for linear or rotational motions. Count the number of unknowns and the number of equations including kinematic relationships. These two numbers should match.
5. Eliminate the internal forces to obtain the final and often much simplified equations of motion.

Hints to Problem 2.75: Find out the kinematic relationship of displacements at various points. When the mass is assumed to move down by x, how much point Q is moved down, therefore, how much k_3 is stretched, and how much k_1 and k_2 are stretched or compressed?