
Vibrations - 2

For the double pendulum shown in the figure, the two rods are identical, are assumed to be massless, and are of length l . The two lumped masses are equal and of mass m . Obtain the following:

- (40 points)** The equations of motion of the system in terms of x_1 and x_2 , l , m , and the gravitational acceleration g . Linearize the equations of motion using the small-angle assumption. Write the linearized equations of motion in the matrix form. Identify the mass matrix and the stiffness matrix.
- (20 points)** The natural frequencies of the system.
- (20 points)** The mode shapes.
- (20 points)** Graphically illustrate the mode shapes and indicate the location of the nodes (if any).

