

1. Write the equation of motion for the system shown in Figure 1 and determine its natural frequencies and mode shapes.

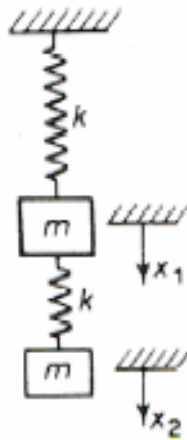


Figure 1

2. Determine the normal modes of the torsional system shown in Figure 2. for $K_1=K_2$ and $J_1=2J_2$.

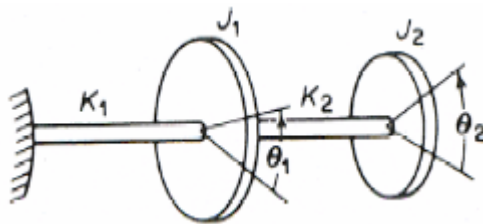


Figure 2

3. For the double pendulum shown in the Figure. 3, set up the equation in term of angles θ_1 and θ_2 measured from the vertical.

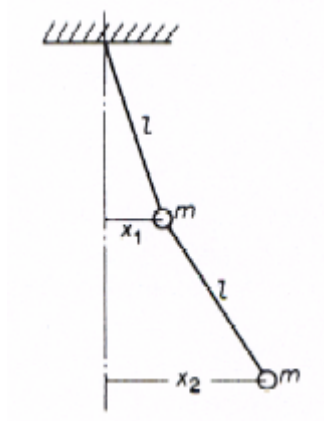


Figure 3

4. Two masses m_1 and m_2 are attached to a light string with tension T , as shown in Figure 4. Assuming that T remains unchanged when the masses are displaced normal to the string, write the equations of motion expressed in matrix form.

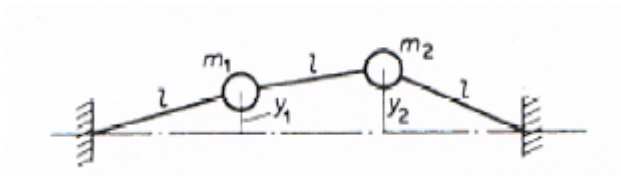


Figure 4

5. If the two masses in Figure 4 are made equal, show that normal mode frequencies are

$\omega = \sqrt{\frac{T}{ml}}$ and $\omega_2 = \sqrt{\frac{3T}{ml}}$. Establish the configuration for these normal modes.

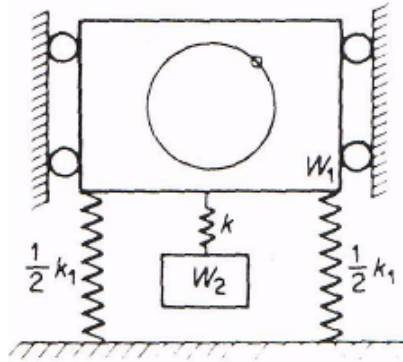


Figure 4