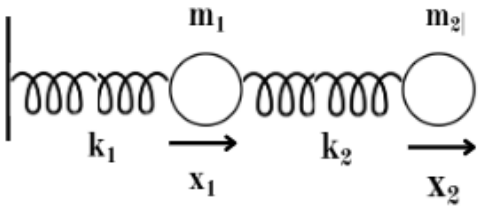
Assignment - 4

Mechanics Assignment 1

Note : Deadline is 10 days from the upload that is october 20 and submit only written format or latex typed pdf files on moodle with its name as follows <Roll_number>.pdf

Question 1

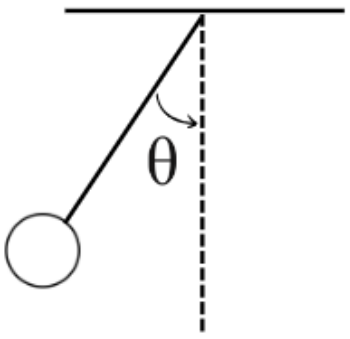
The following system has two masses $\mathbf{m_1}$ and $\mathbf{m_2}$ vibrating (ignore gravity)



1. Write down the kinetic and potential energy and the lagrangian
2. Write down the Lagrange equations for $\mathbf{x_1}$ and $\mathbf{x_2}$
3. Evaluate the normal mode frequencies

Question 2

For simple pendulum as shown below



1. Write down the Lagrangian and evaluate the expression for the generalised momentum $\mathbf{p_\theta}$
2. Write down the Hamiltonian as $\mathbf{H(p_\theta, \theta)}$
3. Draw the phase space trajectories as $\mathbf{p_\theta}$ and $\boldsymbol{\theta}$ when $\boldsymbol{\theta}$ is small

Question 3

For a particle undergoing motion on a plane with inverse square potential $\mathbf{V(r) = -\alpha/r}$ and angular momentum A

1. Evaluate the generalised momentum corresponding to **r** and **θ** what is the energy for which the orbit is bound
2. Evaluate the energy and radius corresponding to a circular orbitt
3. Calculate the minimum and maximum radius of energy **E**