All Assignments

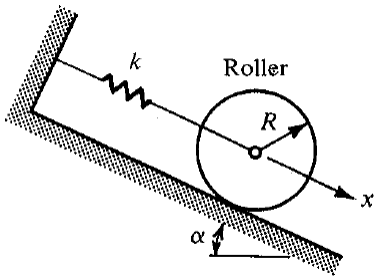
Use MATLAB wherever possible to work the problem or check your work on a problem. ***Whenever a requested problem asks you to plot or sketch the answer, you must use MATLAB to do your work and include a copy of your MATLAB code***.

Treat the homework like a quiz! In other words, don't do the homework with the notes open. Instead, study and learn the material as well as you can, and then try to work the homework problems. If you get stuck, cover up the homework, re-read the notes, and try again.

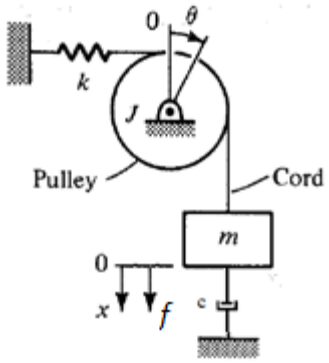
If you work homework as a group, you **must** identify the group[*].

Assignment-5

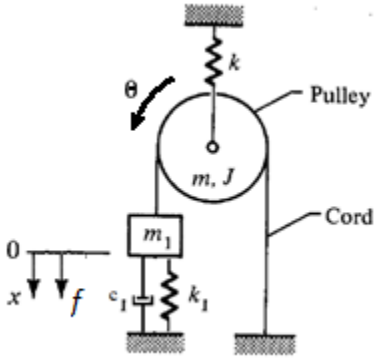
- Reading - Lecture Notes
  - Sections #5
- Homework
  - **5-A)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure. *Assume there is no slippage between the roller and the surface.*



  - **5-B)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure. *Assume there is no slippage between the cord and the pulley.*



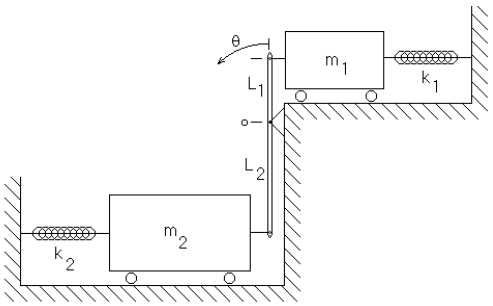
  - **5-C)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure in terms of the given coordinate *x*. *Assume there is no slippage between the pulley and the cord.*



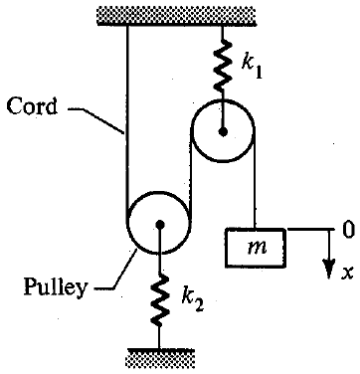
  - **5-D)** Repeat problem 5-C, but solve the equations in terms of the given coordinate *θ*. *Assume there is no slippage between the pulley and the cord.*

[*] *Remember that failure to provide proper reference/citation is called* ***plagiarism.***

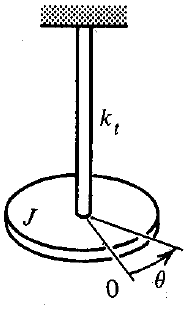
- **5-E)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure in terms of the given coordinate θ. *Assume that the system is shown in its static equilibrium position and that the connecting link is rigid, massless, and can only rotate through a small angle (i.e. the ends of the link essentially translate)*



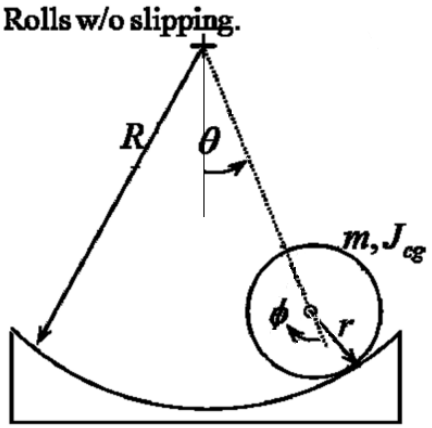
- **5-F)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure. *Neglect the mass of the pulleys.*



- **5-G)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure. *Assume the mass of the torsion bar is negligible.*



Solve rolling disc problem by both Newton's Method and Lagrange's Method. This problem involves rotating relative coordinates. The θ coordinate is measured counter-clockwise absolutely as the line from the center of curvature of the surface through the center of the disc. The ϕ coordinate is measured clockwise relative to the point of contact of the disc with the surface. [Be very careful about the kinematics.]



- **5-H)** Using Newton's Method, select a set of coordinates, draw the complete two-sided free body diagram, identify any constraint equations, and determine the equations of motion for the adjacent figure in terms of the given coordinate θ.

- **5-I)** Using Lagrange's Method, select a set of coordinates, identify any constraint equations, and determine the equations of motion for the adjacent figure in terms of the given coordinate θ.

- **5-J)** Discuss briefly the differences in effort (and thought process) required for the two solution approaches for problems 5-H and 5-I.