All Assignments

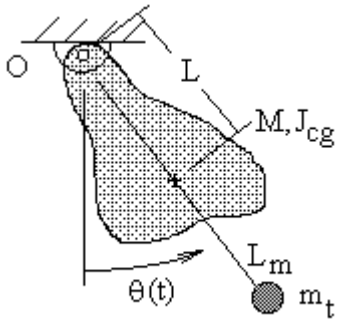
Use MATLAB wherever possible to work the problem or check your work on a problem. ***Whenever a requested problem asks you to plot or sketch the answer, you must use MATLAB to do your work***.

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-8

- Reading
  - Handout sections #10 & #11
- Reference
  - *Tse, Morse, & Hinkle* Chapter 4
- Homework
  - **8-A)** For the following figure, develop the exact and linearized equation of motion by either Newton's Method or Lagrange's Method. *Note: assume that the tuning mass (m_t) is connected to the main mass (M) by a fixed rigid massless rod.*



  - **8-B)** Given the following Mass, $M = \begin{bmatrix} 20 & 0 \\ 0 & 12 \end{bmatrix}$ kg, and Stiffness, $K = \begin{bmatrix} 2000 & -600 \\ -600 & 1200 \end{bmatrix}$ N/m, matrices, find the natural frequencies (express in both rad/sec and Hz) and mode shapes. *Note: evaluate using the procedure given in sections 10 and 11 of the notes. You may check your answers using MATLAB.*

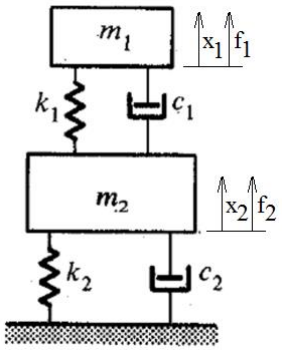
  - **8-C)** For the following Mass and Stiffness matrices, the natural frequencies are (approx.) $2.38, 4.30, \& 10.51\ Hz$, find their associated mode shapes. *Note: evaluate using the procedure given in sections 10 and 11 of the notes.*

$$M = \begin{bmatrix} 8 & 3 & 0 \\ 3 & 4 & 1 \\ 0 & 1 & 5 \end{bmatrix} kg \qquad K = \begin{bmatrix} 6050 & -3630 & 0 \\ -3630 & 6050 & -1210 \\ 0 & -1210 & 3630 \end{bmatrix} N/m$$

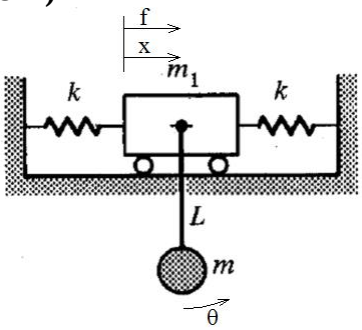
For each of the following figures, develop the exact and linearized equations of motion in terms of the coordinates given by both Newton's Method and Lagrange's Method. Express the linearized equations of motion in matrix form.

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

- **8-D)**



8-E)



- Selected Answers
  - **8-A)** (b) $J_{cg} = 0.0562$ kg.m^2