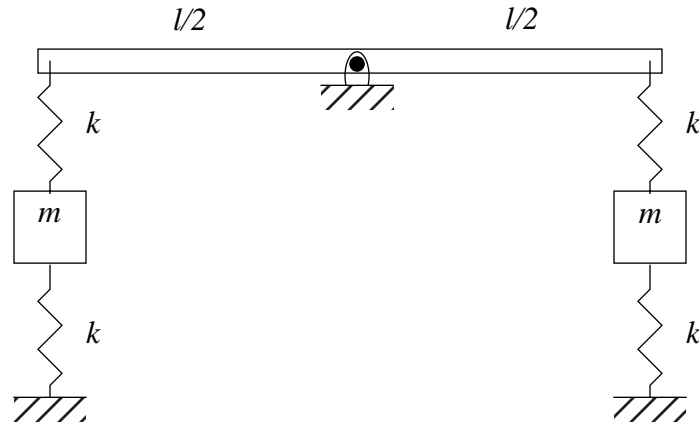


ME 460/660 Final Exam, Fall '95

25 points each

- 1) Derive the equations of motion for the system below using Lagrange's equations. The rod has mass M_1 . (Hint: $J = M_1 l^2 / 12$)



- 2) Find the S matrix for the following system:

$$M = \begin{bmatrix} 9 & 0 \\ 0 & 9 \end{bmatrix}$$

$$K = \begin{bmatrix} 4 & -1 \\ -1 & 4 \end{bmatrix}$$

- 3) A rotating machine weighing 4000 lb. has an operating speed of 2000 rpm. It is desired to reduce the amplitude of the transmitted force by 80%. Choose the combined stiffness for a set of isolation pads to accomplish this design goal.
- 4) Find the response of an undamped system to a step function with a finite rise time of t_1 for the case of $m = 1$ kg, $k = 1$ N/m, $t_1 = 2\pi$ s, and $F_0 = 20$ N. This function is described by

$$F(t) = \begin{cases} F_0 \frac{t}{t_1} & 0 \leq t \leq t_1 \\ F_0 & t > t_1 \end{cases}$$