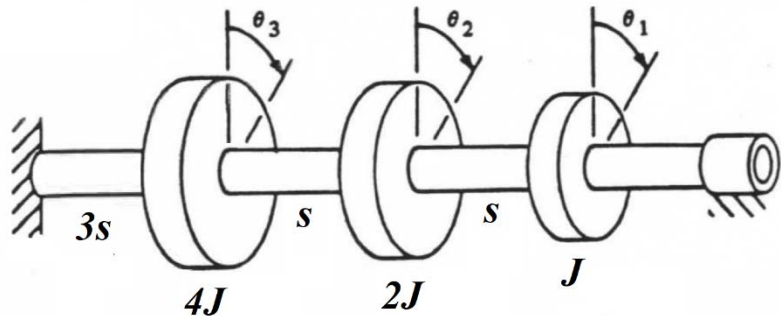


MECH 463 -- Homework 8

1. Three gear wheels are mounted on a flexible shaft. The left end of the shaft is fixed and the right end rotates freely in a journal bearing. The moments of inertia of the three gear wheels are respectively J , $2J$ and $4J$. The torsional stiffnesses of the parts of the shaft between the gear wheels are respectively s , s and $3s$. (Why are we not interested in the stiffness in the part of the shaft furthest to the right ?) Formulate the equations of motion of the system and determine the mass and stiffness matrices. Use Matlab routine `[V,D] = eig(A,B)` to evaluate the natural frequencies. Plot the mode shapes. Do they have the expected shapes ?



2. The diagram shows an idealized damped vibrating system. The rod supporting the two masses may be assumed to be rigid and have negligible mass. Find the natural frequencies, damping factors and mode shapes of the system. Rearrange the matrix equation of motion into double size matrix form and use Matlab routine `[V,D] = eig(A,B)` to evaluate the natural frequencies and damping factors. Confirm that the results are the same as found in Tutorial 8.

