

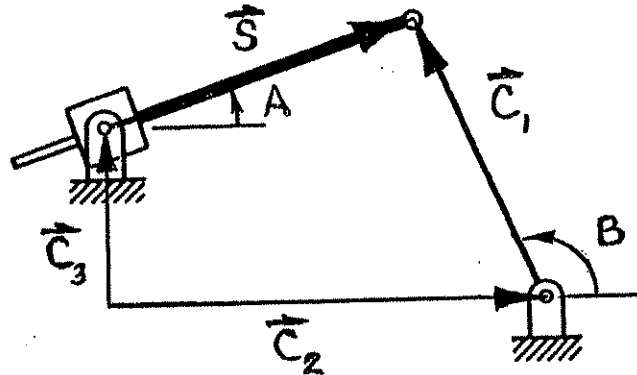
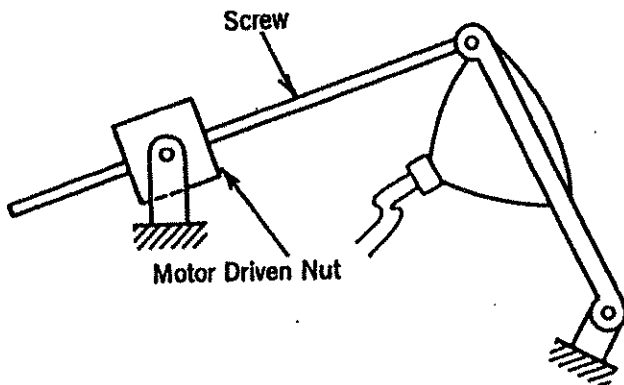
LEHIGH UNIVERSITY
Department of Mechanical Engineering and Mechanics

ME 252

Mechanical Elements

Spring 2005

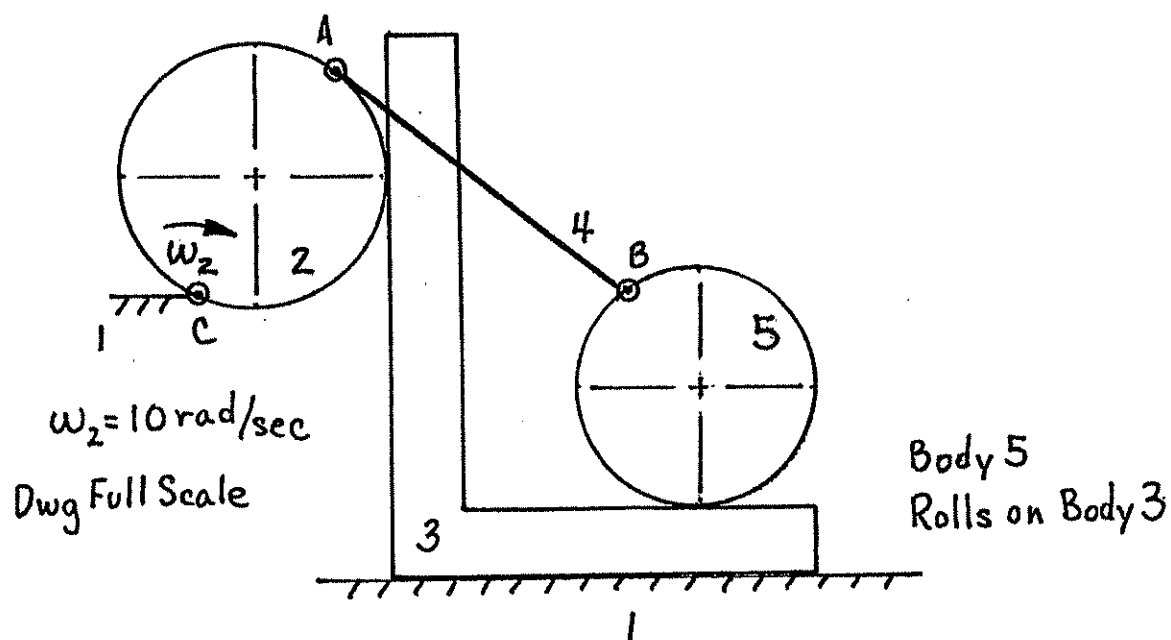
1. (35) A retractable headlight mechanism for a sports car is shown in the figure. A motor driven nut at the left pivot causes the screw to move, raising or lowering the headlight. Using the vector system shown to describe analytically the kinematics of this device with S and \dot{S} as the input, determine the following:
- (10) a) Write the position loop equations in their real form. List or indicate the unknowns.
 - (10) b) Determine the velocity loop equations in their real form. List or indicate the unknowns.
 - (10) c) Determine the Jacobian matrix for the system and find its inverse.
 - (5) d) Set up the matrix equations to find the velocity coefficients. Do not solve.



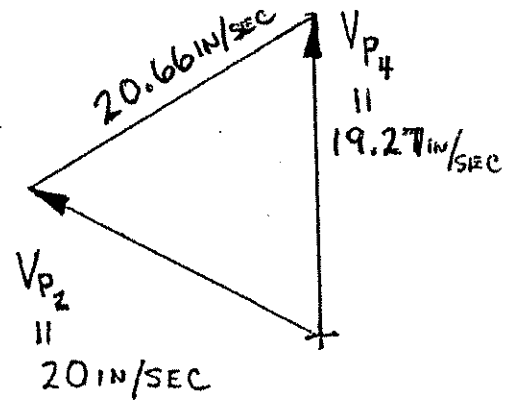
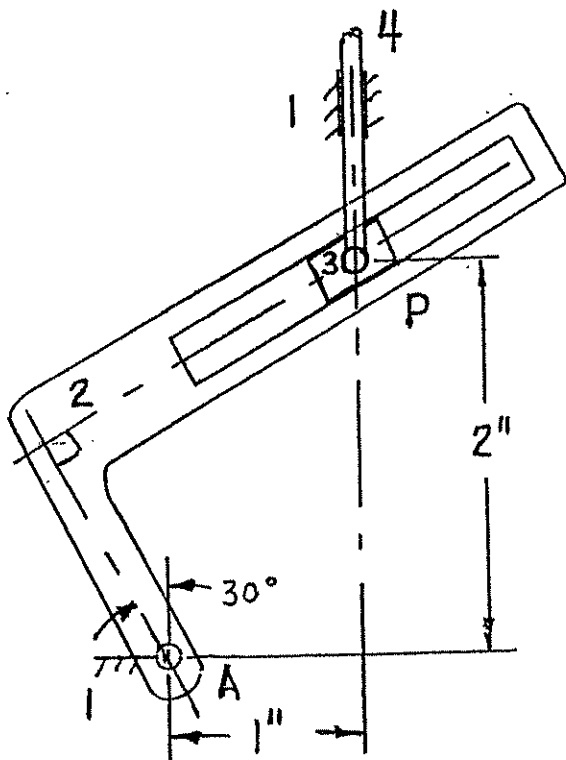
2. (25) For the mechanism shown in the position given, determine by a graphical technique:

(10) a) the velocity of body 3.

(15) b) the angular velocity of body 4.



3. (25) Determine the acceleration of body 4, by a graphical technique if the angular acceleration of body 2 is zero.



4. (15) Using a mobility criteria, determine the degree(s) of freedom for the mechanism.

