MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Department of Mechanical Engineering

Course 2.05 **Kinematics and Dynamics of Mechanisms and Manipulators**
Fall 2000

Problem Set No. 1 Assigned: 09/12/00
Due: 09/19/00

Problem 1.1

(a) What is kinematics?

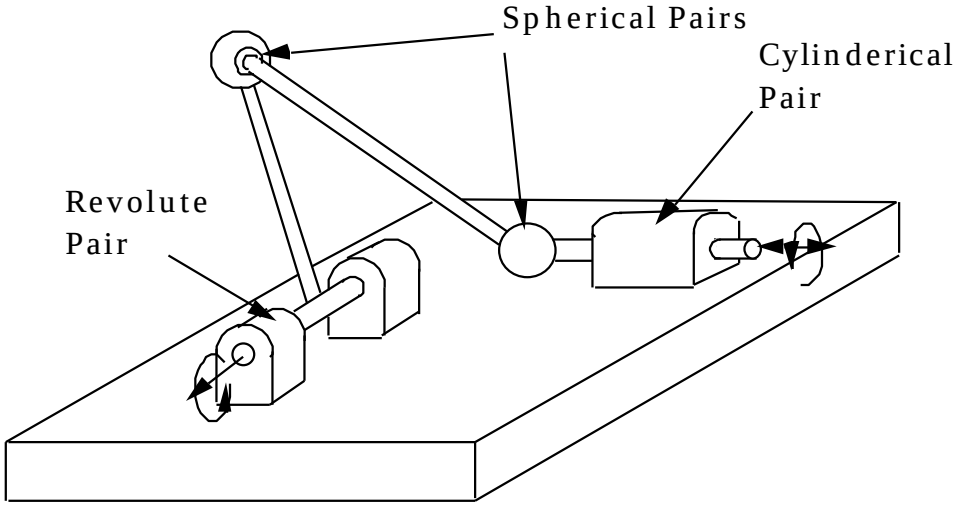
(b) Explain the difference between kinematic synthesis and kinematic analysis.

(c) Can kinematic analysis be used to determine the motion of a kinematic chain which has 3 DOF, but only 2 independent input motions specified? If not, how can the problem be solved?

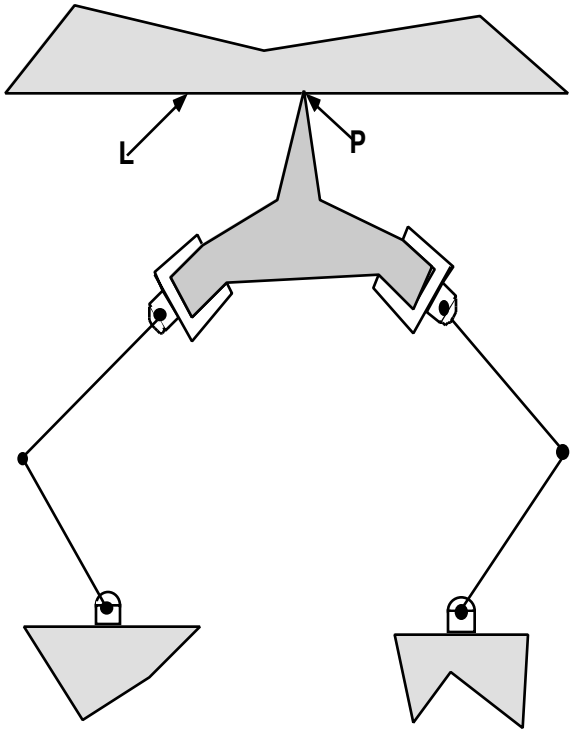
(d) Distinguish between high and lower order pair connections.

Problem 1.2

Calculate the degree of freedom of the spatial RSSC shown below.



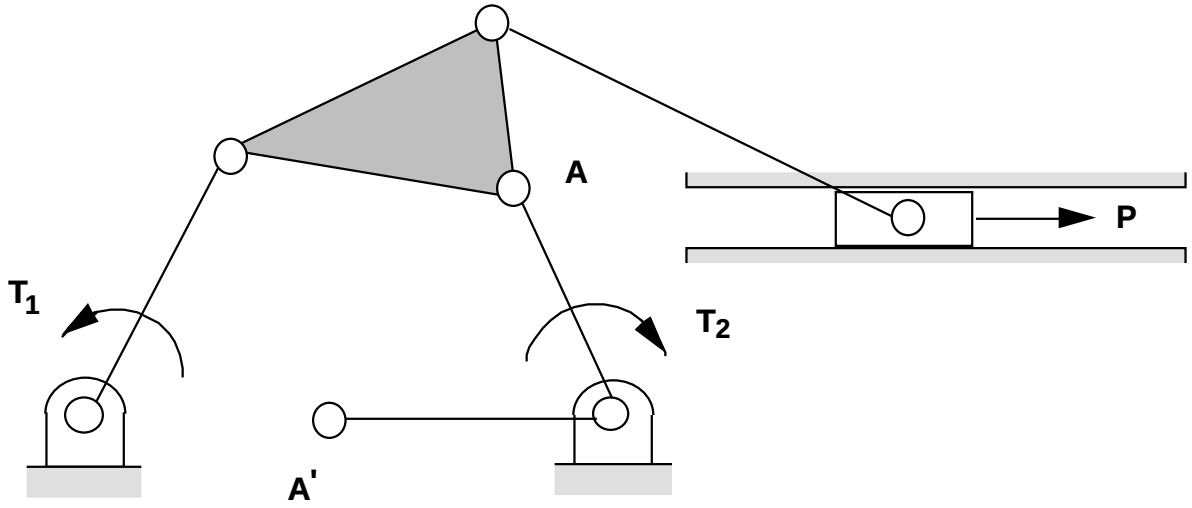
Problem 1.3



The cooperating robot system shown holds the point P on the line L. What is the mobility of the system?

Problem 1.4

(a) For the mechanism shown below point A moves to position A'. Draw (directly on the figure) one configuration of the entire mechanism when A is at A'.



(b) How many possible configurations are there? (assume none of the links are flipped over)

(c) Calculate the degree of freedom of this system.

(d) If 2 torques (T_1 and T_2), and a force, P, are applied to this mechanism-how many must be known in order to calculate the entire set of 3. Explain your answer completely.