

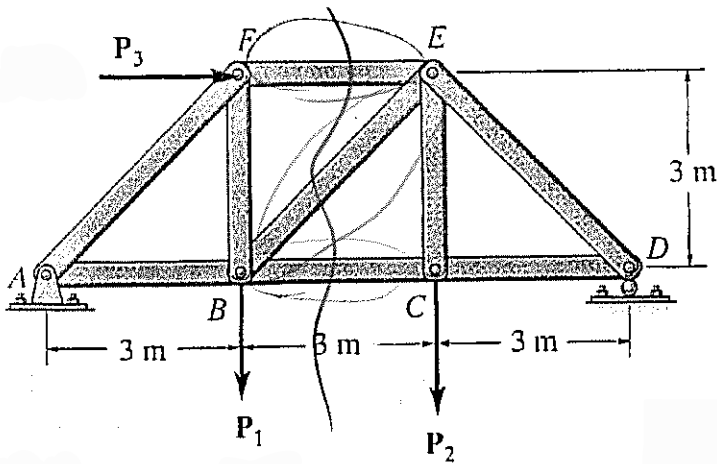
Name:

SID:

**Total Points: 32 (3 Problems)**

Show all your work and write neatly. Clearly state the direction of the forces you evaluate. Partial credit will be given. Good luck!

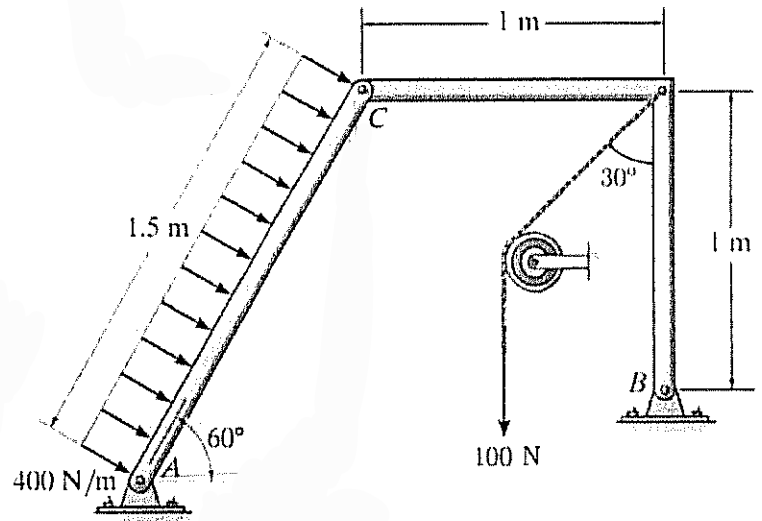
**Problem 1 (10 points)** - Suppose that  $P_1 = 6$  kN,  $P_2 = 9$  kN, and  $P_3 = 12$  kN. Determine the force in the members BC, BE, and EF of the truss and state if the members are in tension or compression.



**Problem 2 (12 points)**

A two-member frame is subjected to external loads as shown below.

- Draw the free-body diagram of member AC and CB. (4 points)
- Determine the magnitude of the horizontal and vertical components of the force acting on pin C. (8 points)



**Problem 3 (10 points)** – The pipe of weight  $W$  is to be pulled up the inclined plane of slope  $\alpha$  using a force  $P$ .

a) Draw a free-body diagram of the pipe. (4 points)

b) If  $P$  acts at an angle  $\phi$ , show that for slipping  $P = W \sin(\alpha + \theta) / \cos(\phi - \theta)$ , where  $\theta$  is the angle of static friction;  $\theta = \tan^{-1} \mu_s$ . (6 points)

