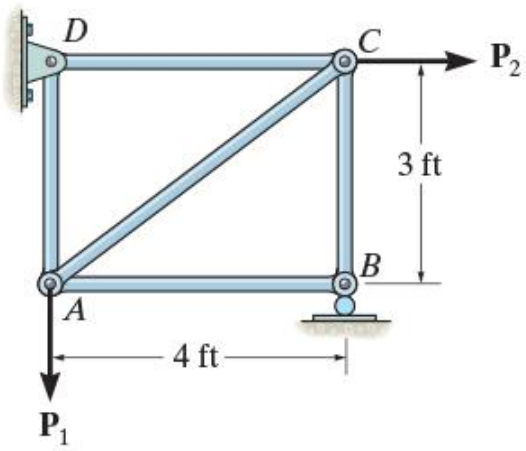
MEC85 / CEC30 Midterm 1 – Spring 2019
Professor Grace X. Gu

Name: SID:

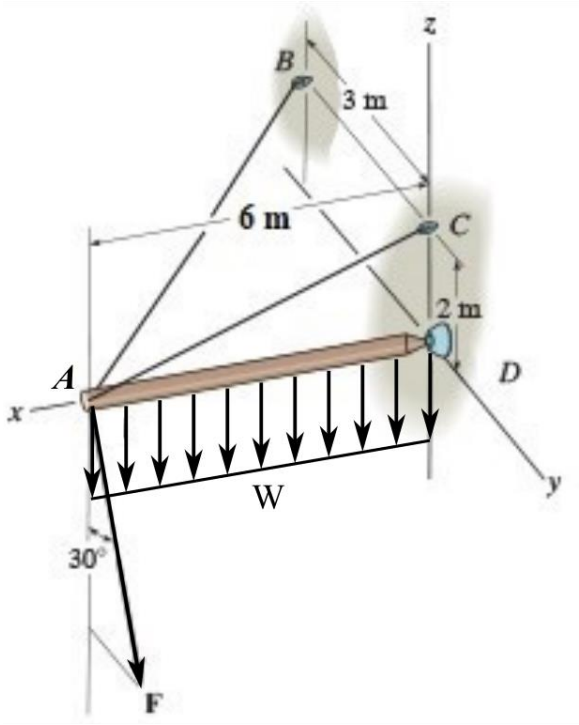
Total Points: 40 (3 Problems)
Show all your work and **write neatly**. Clearly state the direction of the forces you evaluate. Partial credit will be given. Good luck!

Problem 1 (10 points) - Suppose that P_1 = 550 lb and P_2 = 600 lb. Determine the force in the members AB, AC, AD, BC, and CD of the truss. State the absolute value of force and state if the members are in tension or compression.



Problem 2 (16 points) – The massless rod is supported by ball-and-socket joint D and cables AB, AC and is subjected to a force of magnitude **F** (N) and a constant distributed load of **W** (N/m). For this problem, you do not need to report your answers with decimal values.

a) Draw a free-body diagram of the rod. (4 points)
b) Determine the tension in cables AB and AC in terms of **F** and **W**. (8 points)
c) Determine the components of the reaction at support D in terms of **F** and **W**. (4 points)



Problem 3 (14 points) - The 33-lb hoop has a radius r = 300 mm. The coefficient of static friction between the hoop and the surfaces A and B is μ_s = 0.2.

a) Draw a free-body diagram of the hoop. (4 points)
b) Determine the maximum horizontal force P that can be applied to the hoop without causing it to rotate. (8 points)
c) Consider the hoop to now have a radius twice as large with the same weight. What is the ratio of the new value of P to the original value of P? (2 points)