UNIVERSITY OF ARKANSAS

MEEG 4003 **Name:** _____

(Underline your **last name**.)

Final Exam **ID#:** _____

1. (30%) The Geneva mechanism shown in Fig. P1 consists of a star wheel *S* and a driving wheel *D*. It is known that the driving wheel *D* rotates with a constant angular velocity $\boldsymbol{\omega}_D = 3$ rad/s ↺. For the instant when $\theta = 60°$, determine (*a*) the angular velocity $\boldsymbol{\omega}_S$ and angular acceleration $\boldsymbol{\alpha}_S$ of the star wheel *S*, (*b*) the velocity $\mathbf{v}_{B/S}$ and acceleration $\mathbf{a}_{B/S}$ of the engaging pin *B* on the wheel *D* relative to the wheel *S*.

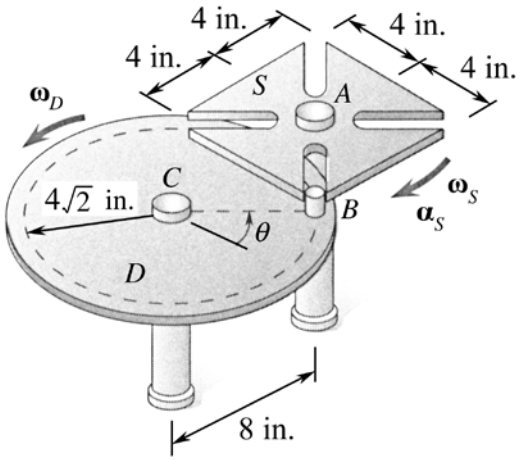

Fig. P1

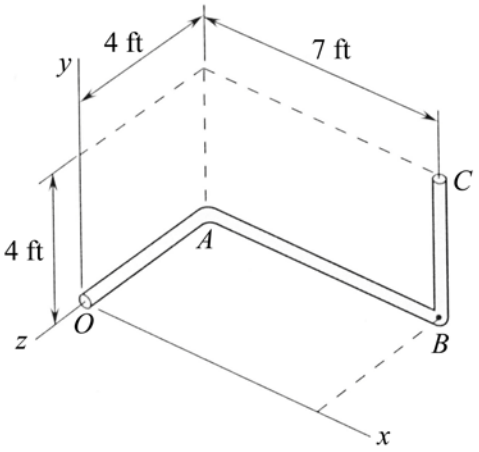

Fig. P2

2. (20%) The slender bent rod *OABC*, shown in Fig. P2, weighs 6.44 lb/ft. Determine the moment of inertia of this bent rod about the axis joining the points *O* and *C*.

3. (30%) A 64.4-lb rectangular plate is falling with a downward velocity of 14 ft/s and zero angular velocity when its corner *C* strikes the corner *O* of a post as shown in Fig. P3. If the impact is perfectly plastic, determine immediately after impact (*a*) the angular velocity $\boldsymbol{\omega}$ of the plate, (*b*) the velocity $\bar{\mathbf{v}}$ of its mass center *G*.

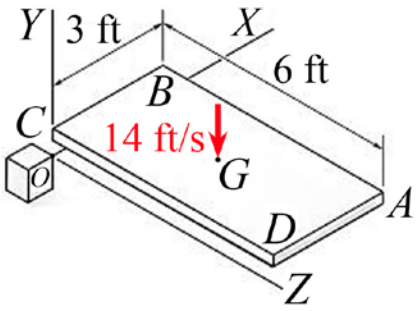

Fig. P3

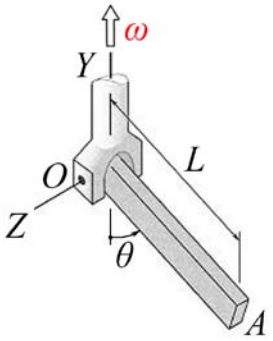

Fig. P4

4. (20%) A slender rod *OA* of length $L = 1.2$ m and mass $m = 3$ kg can rotate freely about the pin in a clevis which remains at the position *O* and is rotated with the vertical shaft about its vertical axis at a constant angular velocity $\boldsymbol{\omega} = 10\,\mathbf{J}$ rad/s as shown in Fig. P4. Applying Euler's equations of motion, determine the angle θ formed by the rod *OA* and the vertical axis.