Problem 1:
A Warren bridge truss is loaded as shown. Determine the force in members CE, DE and DF.

Solution:

Problem 2:
Block A supports a pipe column and rests as shown on wedge B. Knowing that the coefficient of static friction at all surfaces of contact is 0.25 and that $\theta = 45^\circ$ determine the smallest force $P$ for which equilibrium is maintained.

Solution:
Problem 3:
(a) Show that the mass moment of inertia of a slender rod of length $d$ and mass $m$ with respect to an axis perpendicular to it and passing by its center is $I = \frac{1}{12}md^2$.
(b) Three slender homogeneous rods are welded together as shown. Denoting the mass of each rod by $m$, determine the mass moment of inertia and the radius of gyration of the assembly with respect to (i) the $x$-axis, (ii) the $y$-axis, (iii) the $z$-axis

Solution:
(a) See notes.
(b) $I_x = \frac{1}{12}md^2 + \frac{1}{12}md^2 = \frac{1}{6}md^2$, $k_x = \left(\frac{I_x}{m}\right)^{1/2} = \frac{d}{6}^{1/2}$
Symmetry $I_y = I_z = \frac{1}{12}md^2 + m\left(\frac{d}{2}\right)^2 + \frac{1}{12}md^2 + m\left(\frac{d}{2}\right)^2 = \frac{2md^2}{3}$ and $k_y = k_z = \frac{d}{2(3)^{1/2}}$

Problem 4:
To study the performance of a race car, a high-speed motion picture camera is positioned at point A. The camera is mounted on a mechanism which permits it to record the motion of the car as the car travels on straightaway BC.
(a) Determine the speed of the car in terms of $b$, $\theta$, and $\theta'$. ($\theta'$ is the angular velocity)
(b) Determine the magnitude of the acceleration of the race in terms of $b$, $\theta$, $\theta'$, and $\theta''$. ($\theta''$ is the angular acceleration).

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Problem 5:
A 20-kg package is at rest on an incline when a force P is applied to it. Determine the magnitude of P if 10 s is required for the package to travel 5 m up the incline. The static and kinetic coefficients of friction between the package and the incline are 0.4 and 0.3, respectively.

Solution:

Problem 6:
A 300-g block is released from rest after a spring of constant 600 N/m has been compressed 160 mm. Determine the velocity of the block and the force exerted by loop ABCD on the block as the block passes through (a) point A, (b) point B, (c) point C. Assume no friction.

Solution: