1. Replace the force and couple system by an equivalent force and couple moment at point P. Express the results in Cartesian vector form.

Answers: $F_x = 401 - 40j + 55.6k$, lb.

$M_w = -492.5i + 574.2j + 983.1k$, lb-ft.

2. A truck-mounted crane is used to lift a 750 lb. compressor. The weights of the boom AB and of the truck are as shown, and the angle the boom forms with the horizontal is $\alpha = 40^\circ$. Determine the reaction at each of the two (a) rear wheels C, (b) front wheels D.

Answers: $R_C = 2,196$ lb.

$R_W = 804$ lb.

3. A beam is supported with a ball-and-socket joint at point O and by the two cables AC and BC. If a force $\vec{F}$ is applied at point C as shown, determine the tension in the cables. Lengths are in feet and force is in pounds.

Answers: $T_{AC} = 37.7$ lb.

$T_{BC} = 48.46$ lb.

4. A load P of 100 lb. magnitude is supported by the two members AB and CD which are pin connected at C and are placed between the two smooth walls and floor as shown. Determine the horizontal and vertical components of all forces exerted on member AB.

Answers: $B_x = -34.98$ lb.

$A_x = 154.9$ lb.

$C_x = -119.9$ lb.

$P = 100$ lb.
5. The Howe bridge truss is subjected to the loadings shown. List all zero-force members and determine the force in members IH, BI, and SI. Indicate whether the members are in tension or compression.

Answers: B = 21, 21 kN (C)

IH = 35.0 kN (C)

SI = 15.0 kN (C)

4. Determine the moment of inertia of the area shown with respect to a horizontal axis passing through the centroid of the area.

Answers: W = 38.3 in.²

5. The rope which supports block D passes over the fixed drum at E. The rope makes an angle of 45° with the horizontal plane at E. The rope supports a weight of 200 lb at D. Neglecting the weights of the rope and block D, determine the maximum and minimum permissible values of the tension on the rope.

Answers: y = 11 ft, x = 12 ft.