Answers to MEEG 2003 Sample Test Id

1.

(*a*) $\mathbf{M}_A = 210\mathbf{i} + 180\mathbf{j} + 60\mathbf{k}$ N·m

(*b*) $M_{AB} = 40$ N·m

(*c*) Since $M_{AB} > 0$, the action of **F** tends to *loosen* the joint at *A*.

(*d*) $d_{s1} = 4.72$ m

(*e*) $d_{s2} = 1.061$ m

2.

(*a*) L =21.6 in.
(*b*) P = 176 lb

3.

A. (*e*)
B.(*c*)
C. (*f*)
D. (*g*)

4.

A. (*a*) In terms of pound-mass (lbm), 1 lb is defined to be the weight of 1 lbm, where the gravitational acceleration is 9.80665 m/s^2; i.e., 1 lb = 1 lbm (9.80665 m/s^2). (*b*) In terms of kilogram, 1 lbm = 0.45359237 kg.

B. **Newton's third law** states that every action is matched by a reaction, and action and reaction are collinear, opposite in direction, and equal in magnitude.

C. (You need to draw a sketch.) In the formula $\mathbf{M}_P = \mathbf{r} \times \mathbf{F}$ for computing the moment $\mathbf{M}_P$ about point *P***,** the vector **r** is a displacement vector from the moment center *P* to any (convenient) point (e.g., point *A*) on the line of action of **F**.

D. (You need to draw a sketch.) In the formula $M_{BC} = \boldsymbol{\lambda}_{BC} \cdot (\mathbf{r} \times \mathbf{F})$ for computing the moment M_{BC} about axis *BC* of a force **F** acting at point *A*, the vector $\boldsymbol{\lambda}_{BC}$ is a unit vector pointing from point *B* toward point *C* on the axis *BC*, while the vector **r** is a displacement **v**ector from any (convenient) point (e.g., point *B*) on the axis *BC* to any (convenient) point (e.g., point *A*) on the line of action of **F**.