Answers to MEEG 2003 Sample Test Ic

1.

(a) $T_{AB} = 180$ lb

(b) $\mathbf{A} = -60\mathbf{i} - 45\mathbf{j} + 120\mathbf{k}$ lb

(c) $\mathbf{B} = 210\mathbf{j} - 120\mathbf{k}$ lb

(d) $P = 60$ lb

2.

(a) $\mathbf{M}_A = 336\mathbf{i} + 288\mathbf{j} + 96\mathbf{k}$ N·m

(b) $M_{AB} = 64$ N·m

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

(d) $d_{s1} = 9.43$ m

(e) $d_{s2} = 6.71$ m

3.

A. (f)

B. (b)

C. (g)

D. (a)

4.

A. The **rigid-body principle** states that if two collinear forces, equal in magnitude and opposite in direction, are applied to act on a rigid body, they will have no net effect on the condition of rest or motion of the rigid body.

B. In the formula $M_{BC} = \boldsymbol{\lambda}_{BC} \cdot (\mathbf{r} \times \mathbf{F})$ for computing the moment of a force **F** about an axis *BC*, the vector $\boldsymbol{\lambda}_{BC}$ is a unit vector pointing in the direction from *B* to *C*, and **r** is a displacement vector drawn from any (convenient) point on the axis *BC* to any (convenient) point on the line of action of the force **F**.

C. **Varignon's theorem** states that the moment of a force about any point is equal to the sum of the moments of its components about the same point.

D. The moment of a force **F** about a point *P* is actually the same as the moment of this force **F** about a specific axis. This **specific axis** passes through the point *P* and is perpendicular to the plane that contains the point *P* and the line of action of the force **F**.