Answers to MEEG 2003 Sample Test Ic

1.
(a) $T_{AB} = 180 \text{ lb}$
(b) $A = -60\mathbf{i} - 45\mathbf{j} + 120\mathbf{k} \text{ lb}$
(c) $B = 210\mathbf{j} - 120\mathbf{k} \text{ lb}$
(d) $P = 60 \text{ lb}$

2.
(a) $M_A = 336\mathbf{i} + 288\mathbf{j} + 96\mathbf{k} \text{ N} \cdot \text{m}$
(b) $M_{AB} = 64 \text{ N} \cdot \text{m}$
(c) Since $M_{AB} > 0$, the action of $\mathbf{F}$ tends to loosen the joint at $A$.
(d) $d_{s1} = 9.43 \text{ m}$
(e) $d_{s2} = 6.71 \text{ m}$

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 $M_{BC} = \lambda_{BC} \cdot (\mathbf{r} \times \mathbf{F})$ for computing the moment of a force $\mathbf{F}$ about an axis $BC$, the vector $\lambda_{BC}$ is a unit vector pointing in the direction from $B$ to $C$, and $\mathbf{r}$ 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 $\mathbf{F}$.

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 $\mathbf{F}$ about a point $P$ is actually the same as the moment of this force $\mathbf{F}$ 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 $\mathbf{F}$. 