22. $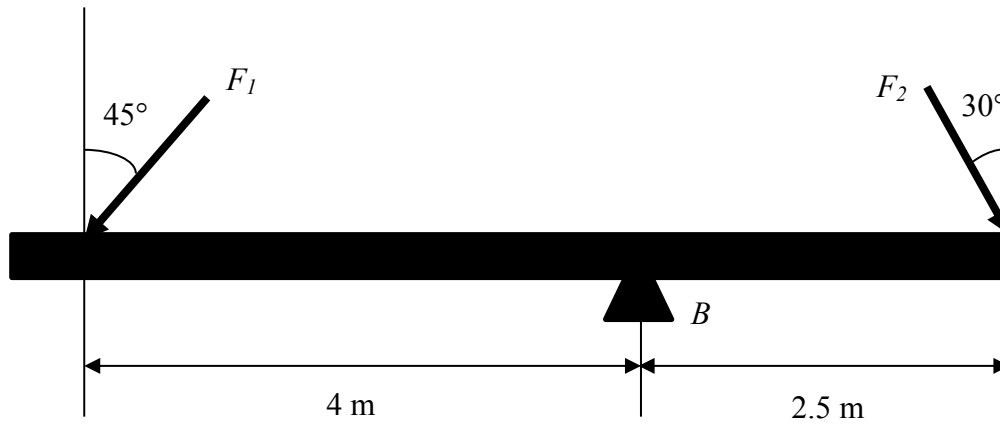F_1$ and F_2 are independently and normally distributed with $F_1 \sim N(300, 3^2)$ N and $F_2 \sim N(500, 6^2)$ N, respectively, determine the distribution of the moment at point B.

Solution

$$M_B = 2.5 F_2 \cos 30° - 4 F_1 \cos 45° \text{ (clockwise)}$$

$$\mu_{M_B} = 2.5 \mu_{F_2} \cos 30° - 4 \mu_{F_1} \cos 45° = 234 \text{ N}\square\text{m}$$

$$\sigma_{M_B} = \sqrt{\left(2.5 \sigma_{F_2} \cos 30°\right)^2 + \left(4 \sigma_{F_1} \cos 45°\right)^2} = 15.52 \text{ N}\square\text{m}$$

Thus, the distribution is $M_B \sim N(234, 15.52^2)$ N$\square$m, clockwise. **ANS.**