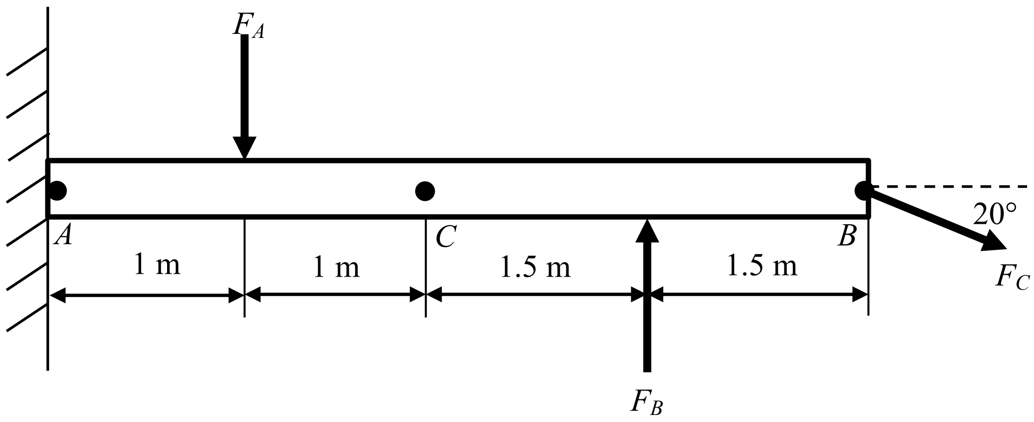
8. Determine the distribution of the internal normal force, shear force, and moment at point C. $F_A \sim N(25, 2^2)$ N, $F_B \sim N(45, 3^2)$ N and $F_C \sim N(55, 2.5^2)$ N are normally distributed and independent with each other.



Solution

(1)
$$\sum F_x = 0; \quad N_c = F_c \cos 20°$$

$$\mu_{N_c} = \mu_{F_c} \cos 20° = 23.49 \text{ N}$$

$$\sigma_{N_c} = \sigma_{F_c} \cos 20° = 1.88 \text{ N}$$

Thus, $N_C \sim N(23.49, 1.88^2)$ N. **Ans.**

(2)
$$\sum F_y = 0; \quad V_c = F_A + F_c \sin 20° - F_B$$

$$\mu_{V_c} = \mu_{F_A} + \mu_{F_c} \sin 20° - \mu_{F_B} = -1.19 \text{ N}$$

$$\sigma_{V_c} = \sqrt{\left(\sigma_{F_A}\right)^2 + \left(\sigma_{F_c} \sin 20°\right)^2 + \left(\sigma_{F_B}\right)^2} = 3.71 \text{ N}$$

Thus, $V_C \sim N(-1.19, 3.71^2)$ N. **Ans**.

(3)
$$\sum M_c = 0; \quad M_c + F_B(1.5) + F_A(1) - F_C \sin 20°(3) = 0$$

$$\mu_{M_c} = -\mu_{F_B}(1.5) - \mu_{F_A}(1) + \mu_{F_C} \sin 20°(3) = -36.07 \text{ N}\cdot\text{m}$$

$$\sigma_{M_c} = \sqrt{\left(\sigma_{F_B}(1.5)\right)^2 + \left(\sigma_{F_A}(1)\right)^2 + \left(\sigma_{F_C} \sin 20°(3)\right)^2} = 5.55 \text{ N}\cdot\text{m}$$

Thus, $M_C \sim N(-36.07, 5.55^2)$ N·m Anticlockwise **Ans**.