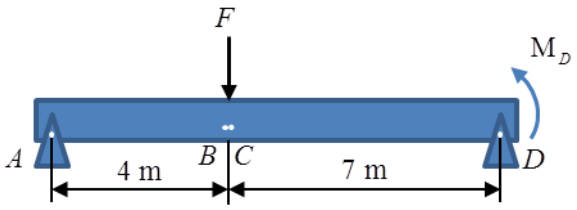
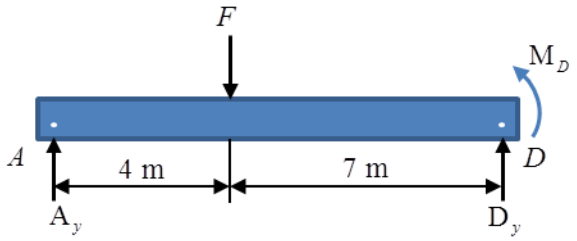
1. The beam supports a normally distributed force $F \sim N(7, 0.1^2)$ kN and a bending moment 12 kN□m at D. Determine the distribution of internal normal force, shear force, and bending moment acting just to the left point B.



Solution



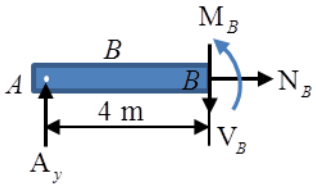
$$\Sigma M_D = 0;\ \ M_D + F(7) - A_y(11) = 0$$

$$A_y = \frac{M_D + 7F}{11}$$

For $M_D = 12$ kN□m and $F \sim N(7, 0.1)$ kN, we get the distribution of A_y

$$A_y \sim N(5.55, 0.06^2) \text{ kN}$$

The free-body diagram of the segment AB is shown as follows



$$\Sigma F_x = 0;\ N_B = 0$$ **Ans.**

$$\Sigma F_y = 0;\ A_y - V_B = 0 \qquad V_B = A_y \sim N(5.55, 0.06^2) \text{ kN}$$ **Ans.**

$$\Sigma M_B = 0;\ -A_y(4) + M_B = 0 \quad M_B = 4A_y \sim N(22.18, 0.25^2) \text{ kN}$$ **Ans.**