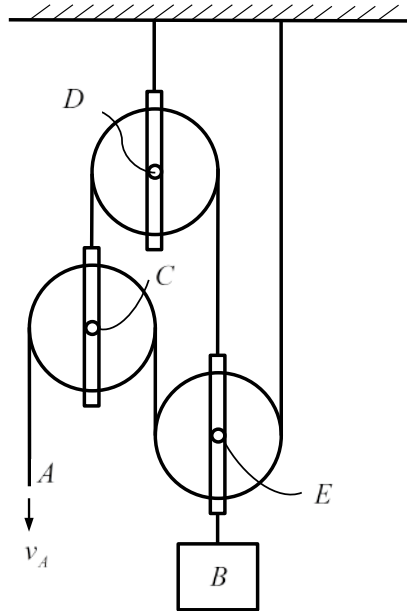


1-5. For the system shown, assume that the end of the cord at A is pulled down with a speed of 5 m/s .

(1) determine the speed of block B .

(2) If $v_A \sim N(\mu_A, \sigma_A^2) = N(5, 0.4^2) \text{ m/s}$, what is the probability that the velocity of the block greater than 1.5 m/s ?



Solution

(1)

$$s_B + s_C = l_1$$

$$(s_A - s_C) + (s_B - s_C) + s_B = l_2$$

The time derivatives of the equations are

$$v_B + v_C = 0$$

$$v_A + 2v_B - 2v_C = 0$$

Eliminating v_C , we obtain

$$v_A + 4v_B = 0$$

So we have

$$v_B = \frac{1}{4}v_A = \frac{5}{4} = 1.25 \text{ m/s } \uparrow$$

Ans.

(2) When $v_A \sim N(\mu_A, \sigma_A^2) = N(5, 0.4^2)$ m/s

$$\mu_{v_B} = \frac{1}{4} \mu_{v_A} = \frac{1}{4}(5) = 1.25 \text{ m/s}$$

$$\sigma_{v_B} = \frac{1}{4} \sigma_A = \frac{1}{4}(0.4) = 0.1 \text{ m/s}$$

$$P(v_B > 1.5) = 1 - P(v_B < 1.5)$$

$$= 1 - \Phi\left(\frac{1.5 - \mu_{v_B}}{\sigma_{v_B}}\right)$$

$$= 0.0062$$

Ans.

