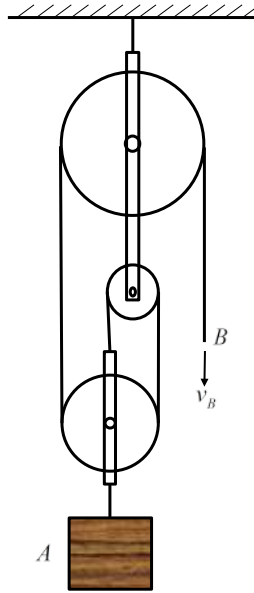1-4. If the rope is pulled down with a speed which follows a normal distribution $v_B \sim N(2, 0.2^2)$ m/s , determine the mean and standard deviation of the speed of block A .

Solution

Position coordinates: The equation with respect to the position coordinates S_A and S_B is

$$S_B + S_A + 2(S_A - a) = l$$

$$S_B + 3S_A = 2a + l$$

Taking time derivatives yields

$$v_B + 3v_A = 0$$

Thus

$$v_A = -\frac{1}{3}v_B$$

Since $v_B \sim N(2, 0.2^2)$ m/s

$$\mu_{v_A} = -\frac{1}{3}\mu_{v_B} = -\frac{1}{3}(2) = -0.667 = 0.667 \text{ m/s } (\uparrow) \qquad \textbf{Ans.}$$

$$\sigma_{v_A} = \frac{1}{3}\sigma_{v_B} = \frac{1}{3}(0.2) = 0.0667 \text{ m/s} \qquad \textbf{Ans.}$$

Datum

a

S_A

S_B

B

A