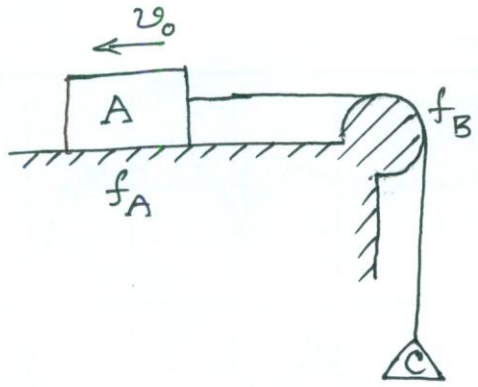
1131/P.327



$f_A = \frac{1}{3}$, $f_B = 0$

$W_A = 64.4$ lb , $W_C = 96.6$ lb

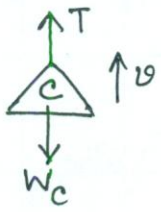
$v_0 = 30$ fps (to left)

$S = 10$ ft

$t = ?$

$\sum F = ma$

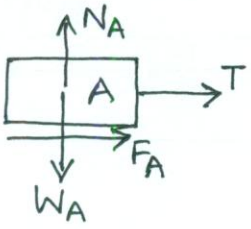
Soln



From freebody of C, taking ~~$\sum F_y = 0$~~ ↑ +ve

$$T - 96.6 = \frac{96.6}{32.2} a$$

i.e. $T = 96.6 + 3a$ ——— (1)



Taking $\sum F_V = 0$, ↑ +ve from freebody of A

$N_A - 64.4 = 0$ i.e. $N_A = 64.4$ lb

$\sum F_H = ma$ ← +ve

$$\Rightarrow -T - F_A = \frac{W_A}{g} \cdot a$$

$$\Rightarrow -T - 64.4 \times \frac{1}{3} = \frac{64.4}{32.2} \times a$$

$$\therefore T = -21.47 - 2a$$ ——— (2)

From (1) and (2)

$$96.6 + 3a = -21.47 - 2a$$

$$\Rightarrow 5a = -118.07$$

$\therefore a = -23.61$ fps^2 (−ve sign implies that velocity is decreasing)

Now, $S = v_0 t + \frac{1}{2} a t^2$

$$\Rightarrow 10 = 30t + \frac{1}{2}(-23.61) \times t^2$$

$$\Rightarrow 11.805 t^2 - 30t + 10 = 0$$

$$\therefore t = \frac{30 \pm \sqrt{30^2 - 4 \times 11.805 \times 10}}{2 \times 11.805} = \frac{30 \pm 20.68}{2 \times 11.805} \text{ s.}$$

$$= 2.15 \text{ s.}, \ 0.39 \text{ s.}$$ Ans.