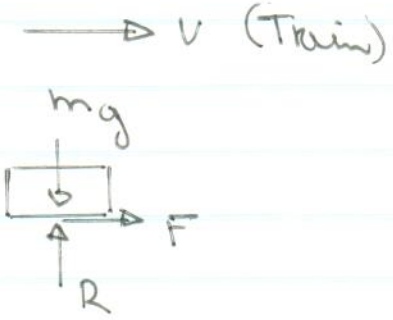
Exercise 5B



(1) Friction to right.
Train is accelerating

+↑) $\Sigma F_y = 0 \therefore R = mg$

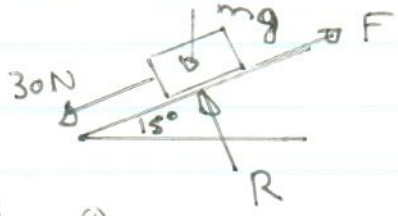
+→) $\Sigma F_x = ma$

$\therefore F = ma$

$\therefore \mu R = ma$

$\therefore \mu mg = ma$

$\therefore \mu = \frac{a}{g} = \frac{4}{10} = 0,4$



(8) +↗) $\Sigma F_x = mg$

$30 + 5(10)\sin 15° - \mu R = 5(0,8) \quad -①$

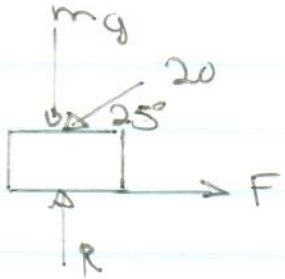
+↑) $\Sigma F_y = 0 \therefore R - 5(10)\cos 15° = 0$

$\therefore R = 48,30 \text{ N}$

Sub into ①: $30 + 50\sin 15° - \mu 48,30 = 5(0,8)$

$\therefore \mu = 0,806$

(14) +↑) $\Sigma F_y = 0$



$R - mg - 20\sin 25° = 0$

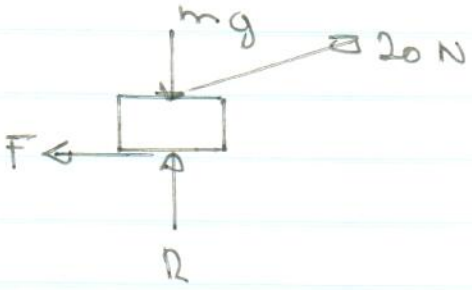
$\therefore R = 4(10) + 20\sin 25° = 48,452$

+→) $\Sigma F_x = 0$: $F - 20\cos 25° = 0$

$\therefore \mu R = 20\cos 25°$

$\therefore \mu = \frac{20\cos 25°}{48,452} = 0,374$

+↑) $\Sigma F_y = 0$



$R - mg + 20\sin 25° = 0$

$\therefore R = 4(10) - 20\sin 25°$

$\therefore R = 31,547$ N

+→) $\Sigma F_x = ma$

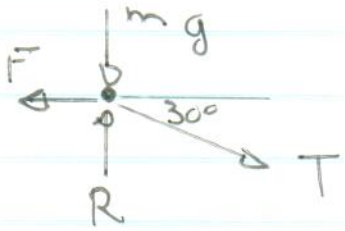
$\mu \quad R$

$-0,374(31,547) + 20\cos 25° = 4a$

$\therefore a = 1,58 \text{ m.s}^{-2}$

Miscellaneous exercise 5

(3) $+\uparrow$) $\Sigma F_y = 0$



$R - mg - T\sin 30^\circ = 0$

$\therefore R = T\sin 30^\circ + 5(10) \quad -①$

$+\rightarrow$) $\Sigma F_x = 0$: $-F + T\cos 30^\circ = 0$

$\therefore -\mu R + T\cos 30^\circ = 0 \quad -②$

Sub ① into ②: $-0,5[T\sin 30^\circ + 50] + T\cos 30^\circ = 0$

$\therefore T = 40,6\ N$

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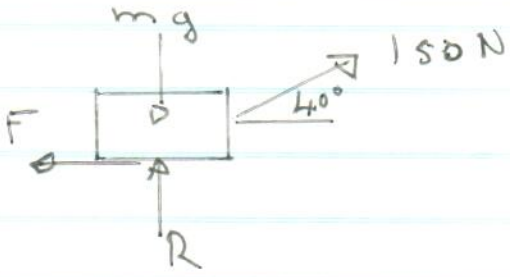
(15) $+\uparrow$) $\Sigma F_y = 0$



$R + 150\sin 40^\circ - 45(10) = 0$

$\therefore R = 354\ N$

$+\rightarrow$) $\Sigma F_x = ma$

$\therefore -F + 150\cos 40^\circ = 45a$

$\therefore -\mu R + 150\cos 40^\circ = 45a$

$\therefore -0,3(354) + 150\cos 40^\circ = 45a$

$\therefore a = 0,196\ m\,s^{-2}$

$s = ut + \frac{1}{2}at^2$

$\therefore 40 = 0 + \frac{1}{2}(0,196)t^2$

$\therefore t = 20,2\ s$