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① $W_{net} = \overrightarrow{F_{net}} \cdot \Delta x$

$\overrightarrow{F_{net}} = \overrightarrow{F_{cos\phi}} - f_s$

$f_s = \mu \cdot N \qquad N = G + \overrightarrow{F_{sin\phi}} \qquad G = m \cdot g$

$\Rightarrow f_s = \mu (mg + \overrightarrow{F_{sin\phi}})$

Sabit hızlı hareket $\Rightarrow \overrightarrow{F_{net}} = 0 \Rightarrow f_s = \overrightarrow{F_{cos\phi}}$

$\mu \cdot mg + \overrightarrow{F_{sin\phi}} \cdot \mu = \overrightarrow{F_{cos\phi}}$

$\mu mg = \overrightarrow{F_{cos\phi}} - \overrightarrow{F_{sin\phi}} \mu$

$\overrightarrow{F} = \dfrac{\mu mg}{(cos\phi - sin\phi \mu)} \Rightarrow W_F = \dfrac{\mu \cdot mg}{(cos\phi - sin\phi \mu)} \cdot cos\phi \cdot s$

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② a) $\lambda dx = \dfrac{M}{L} dx$

$I = \int_{-3L/4}^{L/4} r^2 \, dm \Rightarrow \int_{-3L/4}^{L/4} x^2 \dfrac{M}{L} \Rightarrow \dfrac{M}{L} \cdot \left[\dfrac{x^3}{3}\right]_{-3L/4}^{L/4}$

$I = \dfrac{M}{L} \left(\dfrac{L^3}{(4)^3 \cdot 3} - \dfrac{(-3L)^3}{(4)^3 \cdot 3} \right) \Rightarrow \dfrac{M}{L} \cdot \dfrac{28L^3}{(4)^3 \cdot 3} \Rightarrow I = \dfrac{7L^2 \cdot M}{48} \; kgm^2$

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b)

60 devir/dakika $\Rightarrow \frac{120\pi}{60} = 2\pi$

$w = 2\pi \frac{rad}{s}$ $\quad L = 2\,m$ $\quad K = 2\,kg$

$$W_D = \frac{1}{2} I.(w)^2 \Rightarrow \frac{1}{2} \cdot \frac{7.(2)^2.(2)}{48} \cdot (2\pi)^2$$

$$W_D = \frac{7}{3}\pi^2 \qquad \pi = 3{,}14 \text{ ise } \Rightarrow \frac{7.(3{,}14)^2}{3} \cong \underline{\underline{23\,J}}$$

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③ a) $\vec{P_1} = m_1 . \vec{V_1} \Rightarrow 2.(2i - 10tJ) = 4i - 20tJ \ kg\,m/s$

$\vec{P_2} = m_2 . \vec{V_2} \Rightarrow 3.(4i) = 12i \ kg\,m/s$

$\overrightarrow{P_{net}} \Rightarrow \vec{P_1} + \vec{P_2} = (m_1 + m_2).\overrightarrow{V_{net}}$

$\Rightarrow 16i - 20tJ = 5 . \overrightarrow{V_{net}}$

$V_{net} = \frac{16i - 20tJ}{5}$

b)

$a(t) = \frac{V(t)}{dt} = \frac{-20J}{5} = -4J \ m/s^2$

c)

$\overrightarrow{P_{net}} = 16i - 20tJ \ kg.m/s$

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(4)

$$\sum \tau = I.a = T.R - \tau_f \Rightarrow \tau_f = TR - Ia$$

$$\sum F_y = T - mg = -ma \Rightarrow T = m(g-a)$$

$$\Delta y = V_i.t + \frac{at^2}{2} \Rightarrow a = \frac{2y}{t^2}$$

$$\alpha = \frac{a}{R} \Rightarrow \frac{2y}{Rt^2} \quad \text{ve} \quad I = \frac{M}{2}(R_1^2 + R_2^2) \quad \text{ise}$$

$$I = \frac{1}{2}M\left[R^2 + \left(\frac{R}{2}\right)^2\right] = \frac{5}{8}MR^2$$

$$\tau_f = m\left(g - \frac{2y}{t^2}\right).R - \frac{5}{8}\frac{M.R^2.2y}{(Rt^2)} = R\left[m\left(g - \frac{2y}{t^2}\right) - M\left(\frac{5y}{4t^2}\right)\right]$$