LIZARDI BHI 2008-09	Gaiak:	PUNTUAZIOA:
Fisika-Kimika 2. ebal.	Dinamika	
2009-03-26	Higidura zirkularra	
Izena:		

① a) Indar normalak (N) pisua eta F-ren osagai bertikala orekatu behar ditu:

$N = P + F_y$

$P = 12\,kg \times 10\,\frac{m}{s^2} = 120N$

$F_y = F \times \sin 30^\circ = 60N$

$\boxed{N = 180N}$

b) Lehenengoz indar totala kalkulatuko dugu (higiduraren ardatzean)

$F_{tot} = F_x - F_r$

$F_x = F \cdot \cos 30^\circ = 103,92\,N$

$F_r = \mu \cdot N = 27\,N$

$F_{tot} = 76,92\,N$

Azelerazioa:

$$a = \frac{F_{tot}}{m} = \frac{76,92\,N}{12\,kg} \rightarrow \boxed{a = 6,41\,m/s^2}$$

c) Zinematikaren ekuazioak erabiliz

$$x = x_0 + v_0 \cdot t + \frac{1}{2}at^2 \rightarrow 18\,m = \frac{1}{2} \times 6.41\,\frac{m}{s^2} \times t^2$$

$$t = \sqrt{\frac{2 \times 18\,m}{6,41\,m/s^2}} \rightarrow t = 2,37\,s$$

Amaierako abiadura:

$$v = v_0 + at \rightarrow v = 6,41\,\frac{m}{s^2} \times 2,37\,s \rightarrow \boxed{v = 15,19\,\frac{m}{s}}$$

② a) Jarraituko dugun estrategia honela irudika daiteke:

$$\left.\begin{matrix} a \\ masa \end{matrix}\right\} \rightarrow F_{tot} \rightarrow F_r \rightarrow \mu$$

Indar totala:

$$F_{tot} = m \times a \rightarrow F_{tot} = (20kg + 12kg) \times 2{,}4\ m/s^2$$

$$\rightarrow F_{tot} = 76{,}8\ N$$

Indar totala jakinik, marruskadura-indarra jakin daiteke:

$$F_{tot} = P_1 - T_1 + T_2 - F_r \rightarrow F_{tot} = P_1 - F_r \rightarrow$$

$$\rightarrow 76{,}8\ N = 120N - F_r \rightarrow \boxed{F_r = 43{,}2\ N}$$

Marruskadura-koefizientea:

$$N = P_2 = 200\ N$$

$$F_r = \mu . N \rightarrow \mu = \frac{F_r}{N} = \frac{43{,}2\ N}{200\ N} \rightarrow \boxed{\mu = 0{,}22}$$

b) Tentsioa kalkulatzeko higikari bat isolatuko dugu.

$$F_{tot} = m \times a \rightarrow P_1 - T_1 = m \times a \rightarrow$$

$$120N - T_1 = 12kg \times 2{,}4\ m/s^2 \rightarrow$$

$$120\ N - T_1 = 28{,}8\ N \rightarrow \boxed{T_1 = T_2 = 91{,}2N}$$

③ a) Abiadura angeluarra periodotik kalkula daiteke:

$$\omega = \frac{2\pi}{T} \rightarrow \omega = \frac{2\pi}{0.1\,s} \rightarrow \boxed{\omega = 62{,}83\ rad/s}$$

Unitateak aldatuz:

$$\omega = 62{,}83\ \frac{rad}{s} \times \frac{60\,s}{1\,min} \times \frac{1\ bira}{2\pi\ rad} \rightarrow \boxed{\omega = 600\ b.m.}$$

Abiadura lineala:

$$v = \omega \times R \rightarrow v = 62{,}83\ \frac{rad}{s} \times 2{,}5\,m \rightarrow \boxed{v = 157{,}08\ m/s}$$

b) Azelerazio normala (zentripetoa)

$$a_c = \frac{v^2}{R} \rightarrow \boxed{a_c = 9869{,}65\ m/s^2}$$

c) Higikariaren masa:

$$F = m \times a_c \rightarrow m = \frac{F}{a_c} \rightarrow m = \frac{280\,N}{9869{,}65\ m/s^2}$$

$$\rightarrow \boxed{m = 28{,}37\ g}$$

d) Higiduraren maiztasuna

$$f = \frac{1}{T} \rightarrow f = \frac{1}{0{,}1\,s} \rightarrow \boxed{f = 10\ Hz}$$

④ a) Higiduraren noranzkoa erabakitzeko bi indar hauek alderatu behar ditugu: P_1 eta P_{2x}

$$P_1 = m_1 \times g = 80\,N$$
$$P_{2x} = P_2 \times \sin 30^\circ = 50\,N$$

} Sistemak, honela mugitzeko joera du:

b) Indar normalaren (N) balioa:

$$N = P_{2y} \rightarrow P_{2y} = P_2 \times \cos 30^\circ \rightarrow \boxed{N = 86{,}6\,N}$$

Marruskadura-indarra (F_r):

$$F_r = \mu . N = 0{,}05 \times 86{,}6\,N \rightarrow \boxed{F_r = 4{,}33\,N}$$

c) Azelerazioa:

$$F_{tot} = m \times a \rightarrow F_{tot} = P_1 - P_{2x} - F_r = 25{,}67\,N$$

$$a = \frac{F_{tot}}{m} \rightarrow a = \frac{25{,}67\,N}{18\,Kg} \rightarrow \boxed{a = 1{,}43\,m/s^2}$$

d) Tentsioa

$$F_{tot} = m \times a \rightarrow P_1 - T_1 = m \times a \rightarrow$$
$$80\,N - T_1 = 8\,Kg \times 1{,}43\,m/s^2 \rightarrow$$
$$80\,N - T_1 = 11{,}44\,N \rightarrow \boxed{T_1 = T_2 = 68{,}56\,N}$$