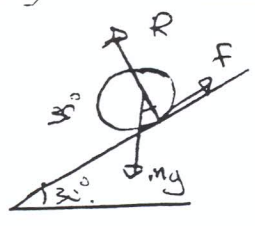


1986

(a) Notes

(b)

Forces



Masses:

Linear
 m

Rotational
 $\frac{1}{2} m r^2$

Accel:

Linear
 $\frac{a}{2}$

Rotational

$\ddot{\theta}$

NII:

Linear

Rotational

|| to plane:

$-F + \frac{mg}{2} = m\ddot{x}$ (1)

$F \cdot r = (\frac{1}{2} m r^2) \ddot{\theta}$

$F = \frac{1}{2} m r \ddot{\theta}$ (2)

⊥ to plane

$R - mg \frac{\sqrt{3}}{2} = 0$ (3)

Disk geometry $\Rightarrow \ddot{x} = r \ddot{\theta}$

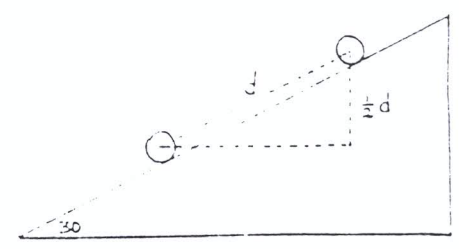
(2) $\Rightarrow F = \frac{1}{2} m \ddot{x}$

(1) $\Rightarrow -\frac{1}{2} m \ddot{x} + \frac{mg}{2} = m \ddot{x}$

$\Rightarrow \frac{mg}{2} = \frac{3}{2} m \ddot{x}$

$\Rightarrow \frac{g}{3} = \ddot{x}$

Using Conservation of Energy



Gain in K.E. = Loss in P.E.

$\frac{1}{2} m v^2 + \frac{1}{2} I \omega^2 = mgh$

$\frac{1}{2} m v^2 + \frac{1}{2} (m r^2) \omega^2 = mg(\frac{r}{d})$

$\frac{3}{2} m v^2 = \frac{m g r}{d}$

$v^2 = \frac{2 g r}{3 d}$

$v^2 = u^2 + 2fs$

$\frac{2 g r}{3} = 0 + 2fd$

Ans. $f = \frac{g}{3d}$