ENGINEERING MECHANICS - STATICS

Rashmi B A

Department of Civil Engineering

ENGINEERING MECHANICS - STATICS
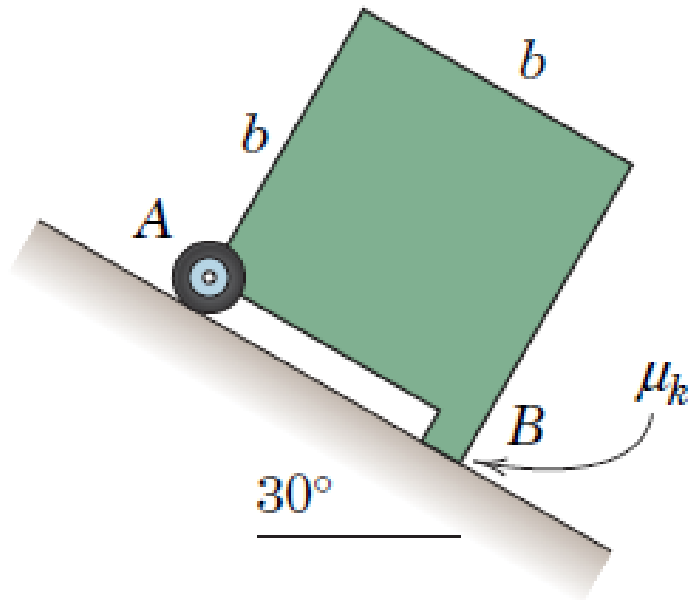
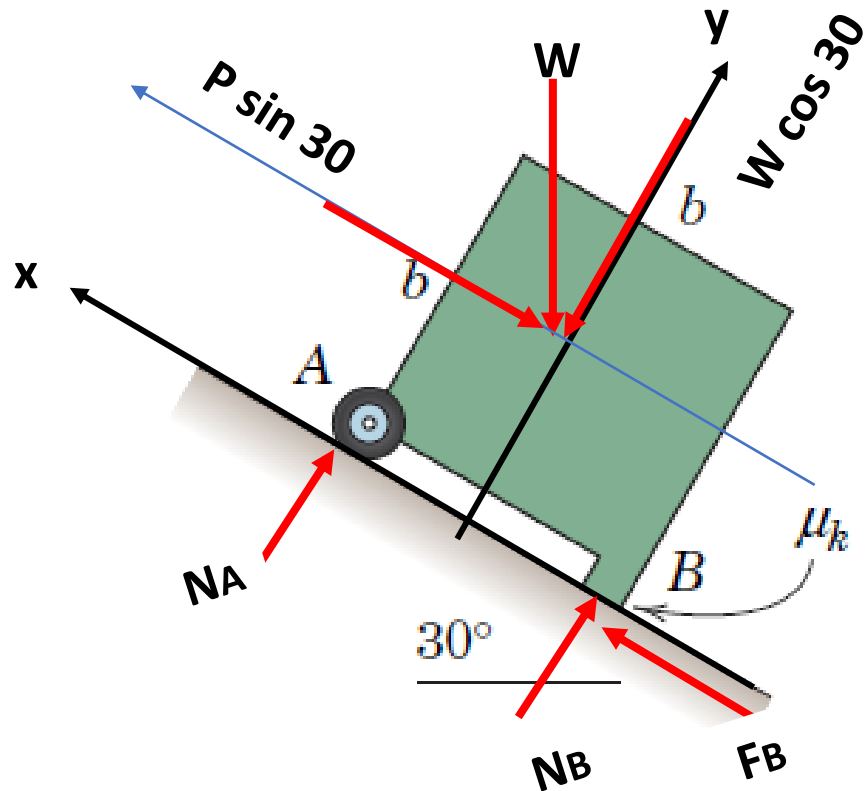## FRICTION

Session- 4

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- Problem 6/8: Determine the coefficient μ_k of kinetic friction which allows the homogeneous body to move down the 30° incline at constant speed.

Problem 6/8 :Solution

Applying the conditions of equilibrium:

$$\sum F_x = 0 \qquad +F_B - W\sin(30) = 0$$
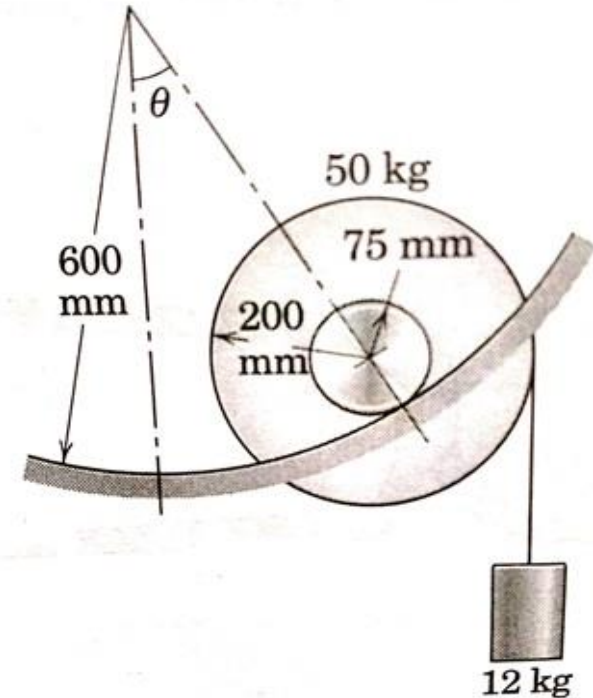
$$F_B = 0.5\,mg - - - (1)$$

$$\sum M_o = 0$$

$$+N_B(b) - W\cos(30)\left(\frac{b}{2}\right) - W\sin(30)\left(\frac{b}{2}\right) = 0$$
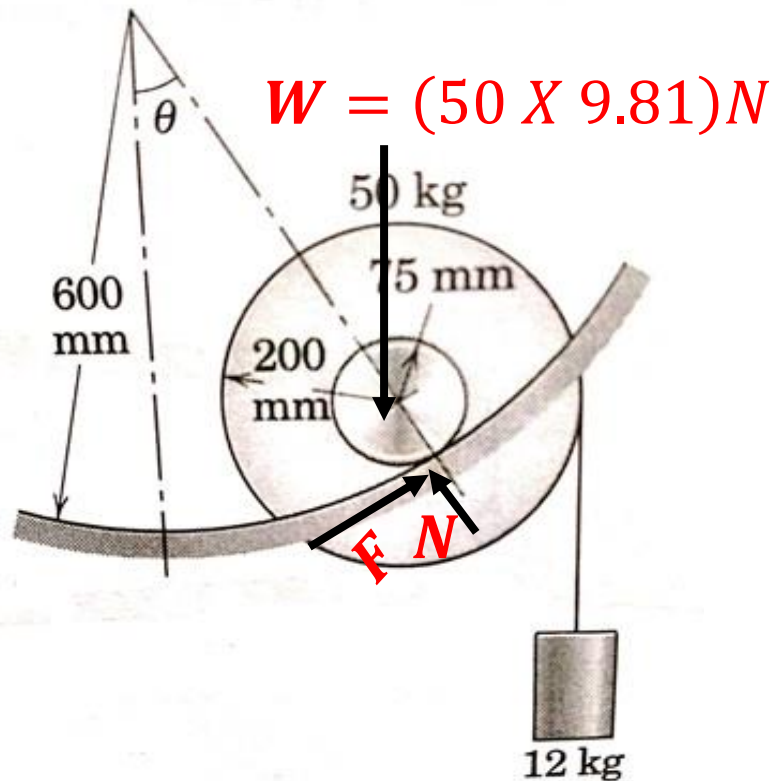
$$N_B = 0.683\,mg - - - (2)$$

from equation 1 & 2

$$\mu_s = \frac{F}{N} = 0.732$$

- **Problem 6/13:** The 50-kg wheel rolls on its hub up the circular incline under the action of the 12-kg cylinder attached to a cord around the rim. Determine the angle at which the wheel comes to rest, assuming that friction is sufficient to prevent slippage. What is the minimum coefficient of static friction which will permit this position to be reached with no slipping?

Problem 6/13: Solution

$W = (50\ X\ 9.81)N$

50 kg

75 mm

600 mm

200 mm

F **N**

12 kg

Applying the conditions of equilibrium

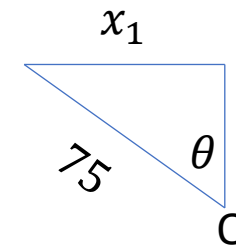$$\sum M_o = 0 \quad -(12\ X\ 9.81)(200 - x_1) + W x_1 = 0 - -(1)$$

To find x_1 consider a triangle

$$\sin\theta = \frac{x_1}{75} => \quad x_1 = 75\ \sin\theta$$

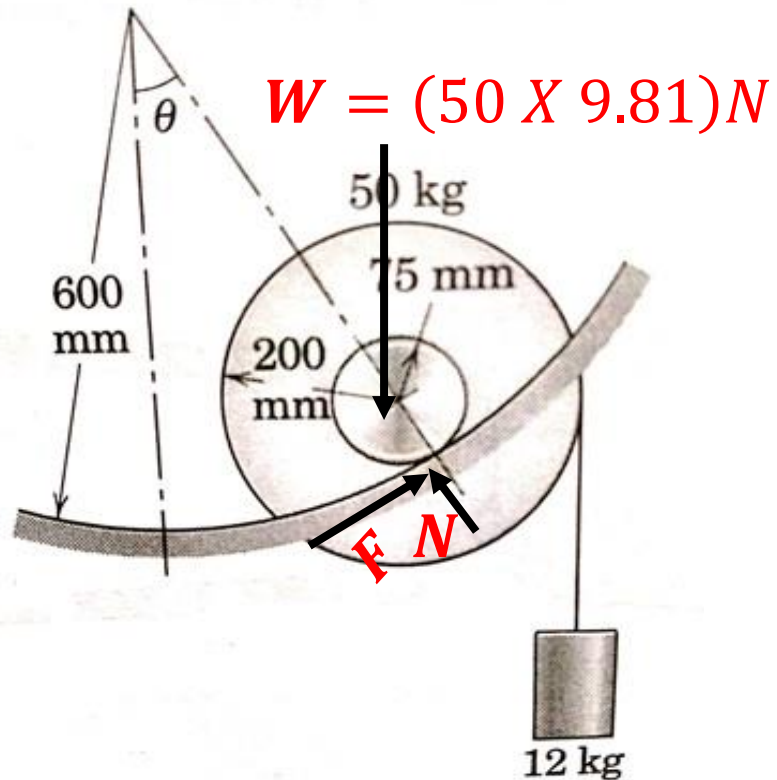substituting in equation (1)

x_1

75

θ

O

$\sin\theta = 0.516$

$\theta = 31.07$

Problem 6/13: Solution

$$\sum F_x = 0 \quad + F - W \sin \theta - (12 \, X \, 9.81) \sin \theta = 0$$

$$\boxed{F = 313.89 \, N}$$

$$\sum F_y = 0 \quad + N - W \cos \theta - (12 \, X \, 9.81) \cos \theta = 0$$

$$\boxed{N = 520.963 \, N}$$

$$\boxed{\mu_s = \frac{F}{N} = 0.602}$$

THANK YOU

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rashmiba@pes.edu