بسم الله الرحمن الرحيم

الحمد لله والصلاة والسلام على رسول الله

King Fahd University of Petroleum & Minerals

CIVIL ENGINEERING DEPARTMENT

CE 201 STATICS (Section **2**)

First Semester 1425 / 2004-05 (**041**)

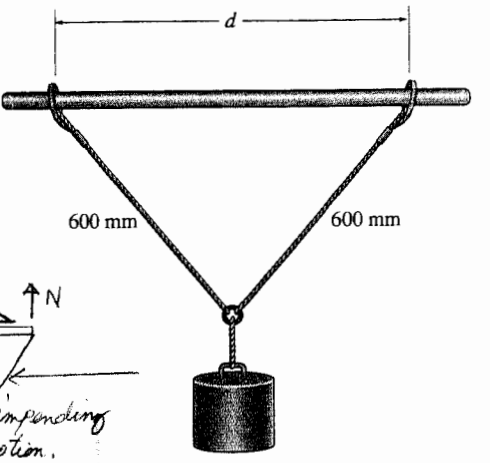
Written Quiz # 10

Score = ____ / 10

Name: Key *ID#:* .....

Note: ***Rewrite*** ***the solution of your homework clearly, neatly, and*** ***completely!!!!!!***

The 5-kg cylinder is suspended from two equal-length cords. The end of each cord is attached to a ring of negligible mass, which passes along a horizontal shaft. If the coefficient of static friction between each ring and the shaft is $\mu_s = 0.5$, determine the greatest distance d by which the rings can be separated and still support the cylinder.

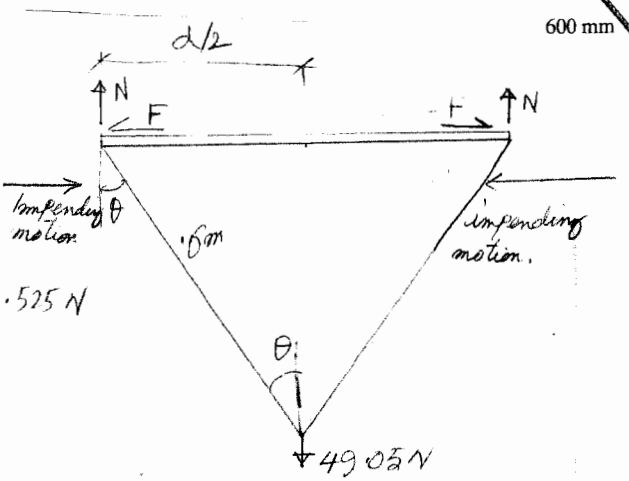


Soln:

Cylinder weight
$= 5 * 9.81 = 49.05 N$

From FBD(a);

for symmetry, $N = \frac{49.05}{2} = 24.525 N$

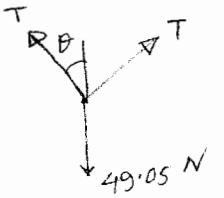


FBD (a)

From FBD (b)

$2T \cos\theta = 49.05$

$\Rightarrow T = \frac{24.525}{\cos\theta}$



FBD (b)

From FBD (c)

at impending motion

$F = \mu_s * N$

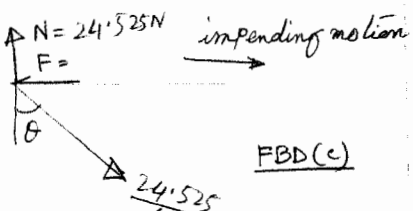
$= 0.5 * 24.525 = 12.2625 N$

$\Sigma F_x = 0$

$\Rightarrow -12.2625 + \frac{24.525}{\cos\theta} \sin\theta = 0$

$\Rightarrow 24.525 \tan\theta = 12.2625$

$\Rightarrow \tan\theta = \frac{1}{2} \quad \therefore \theta = 26.565^\circ$



FBD (c)

Again $\sin\theta = \frac{d/2}{.6} \Rightarrow \sin 26.565 = \frac{d/2}{.6}$

$\Rightarrow d = 0.53666 m$

$\therefore \boxed{d = 536.66 mm}$

Note: There is a quick method for finding 'd' w/o finding T and N; what's it? Try!