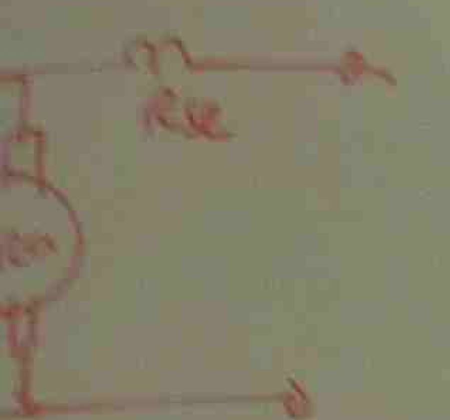
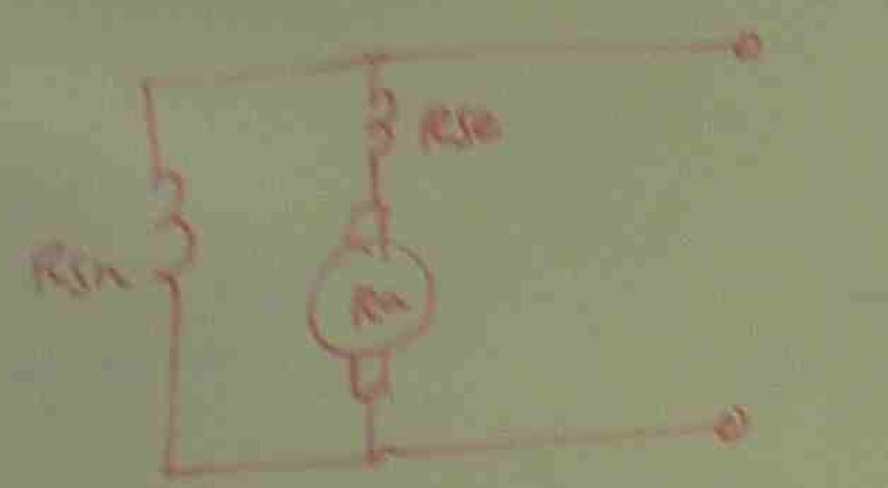
...OUND MOTOR



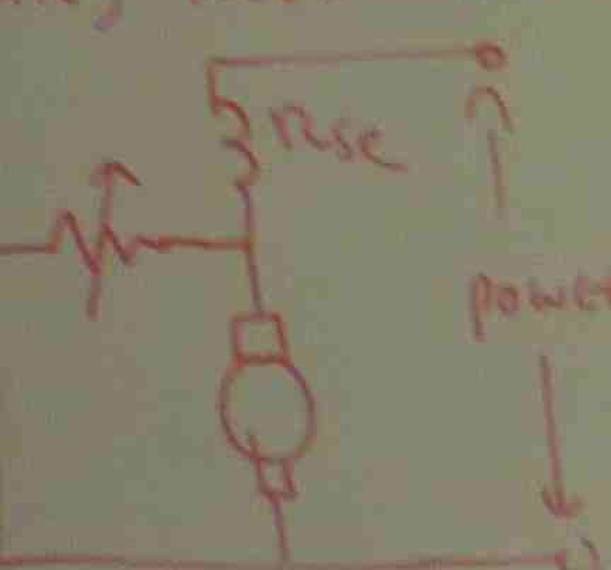
...RT SHUNT COMPOUND

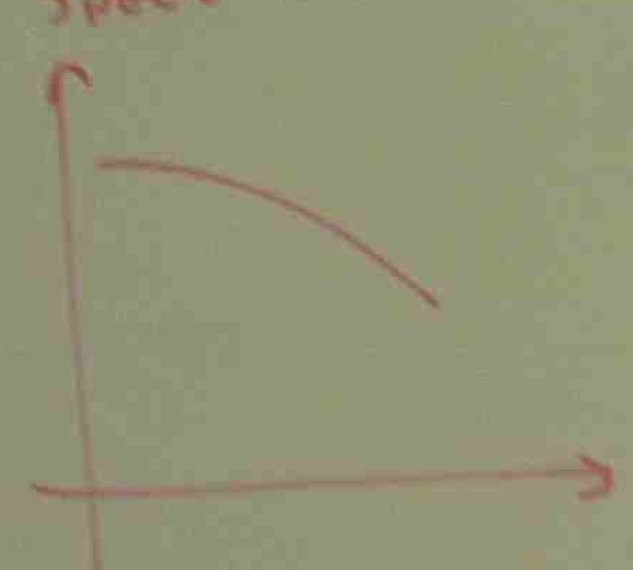


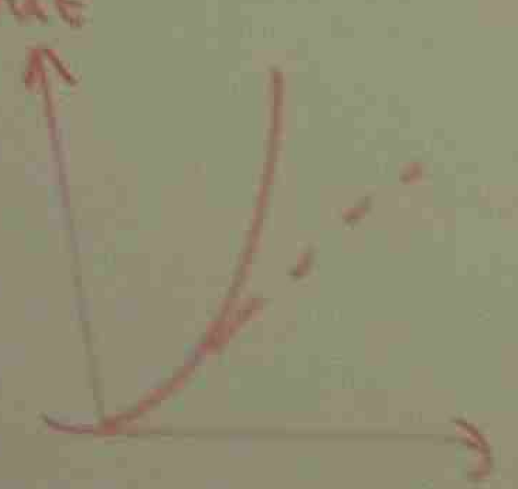
LONG SHUNT COMPOUND

...ULATIVE COMPOUND

...CUMULATIVE COMPOUND MACHINE COMBINES THE
...RACTERISTICS OF BOTH THE SERIES &
...T MOTOR. APPLICATIONS ARE PUNCHES,
...AR, ROLLING MILLS.







G043 + G044 + G045

WEEK 15 REVISION 8/11/11

WEEK 16 FINAL TEST 15/11/11

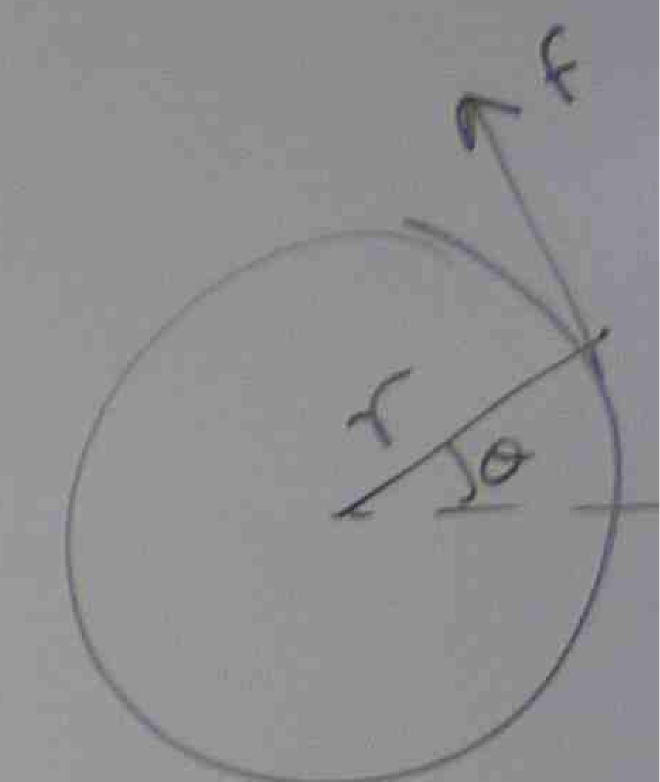
WEEK 17 ALL COME TO CLASS

22/11/11

- BRING BOTH ORANGE & YELLOW FORM
- SIGN RPL

+ ATTACH ANSWER PAPER
+ PRESENT THE FORM TO H/T ALL TOGETHER.
+ ATTENDANCE ROLL SHEET

RELATING THE LINEAR AND ANGULAR VARIABLES



DISPLACEMENT

$$s = \theta \ r$$

s = LINEAR DISPLACEMENT (m)
θ = ANGULAR DISPLACEMENT (Rad)
r = RADIUS

THE SPEED

$$\frac{ds}{dt} = r \frac{d\theta}{dt}$$

$$v = \omega \ r$$

v = LINEAR VELOCITY m/s
ω = ANGULAR VELOCITY RAD/s
r = RADIUS OF CURVATURE (m)

ACCELERATION

$$\frac{dv}{dt}$$

a

a = LINEAR ACCE
r = RADIUS (
α = ANGULAR
a_r = RADIAL

ULAR VARIABLES

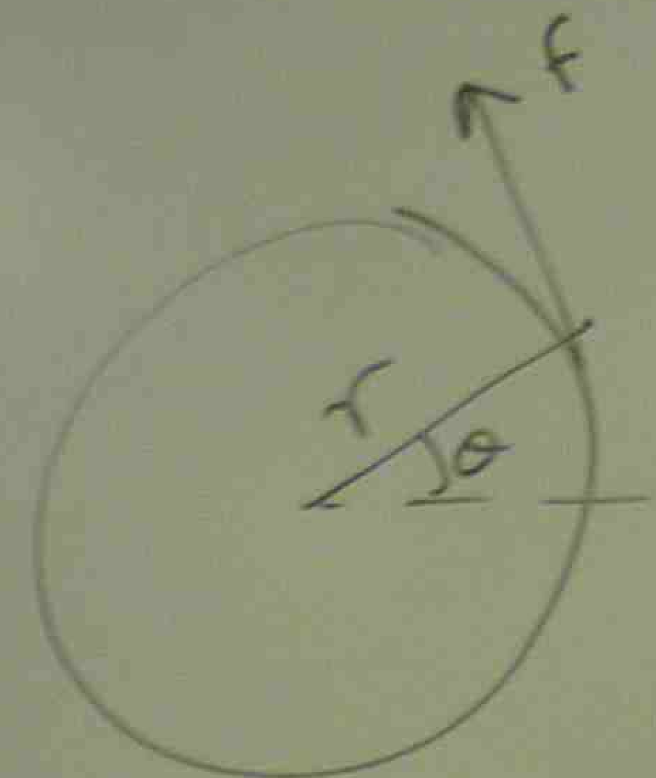
ENT (m)

MENT (Rad)

m/s

ITY RAD/s

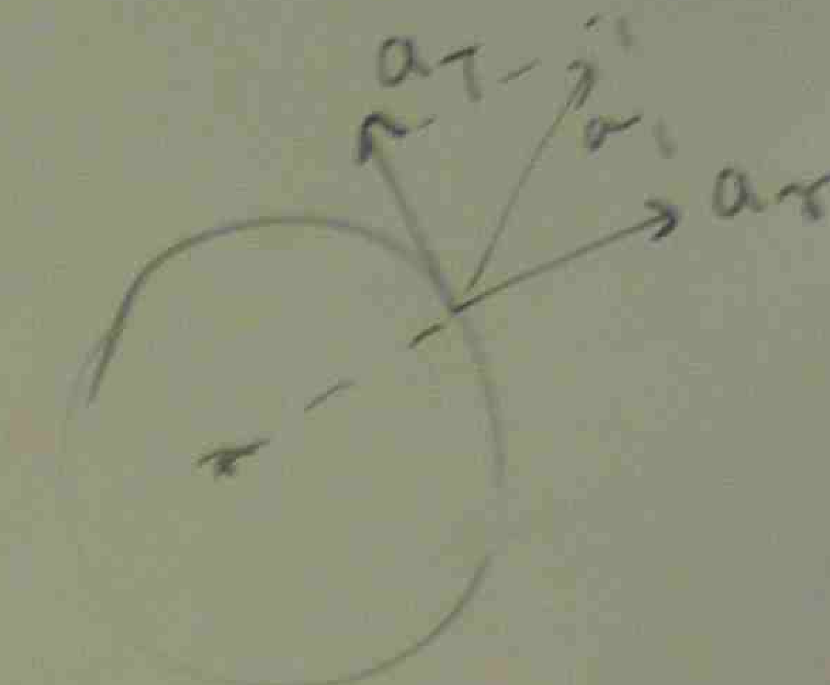
ATURE (m)



$T = \frac{2\pi r}{v}$

T = TORQUE

$T = \frac{2\pi}{\omega}$



$a_r = \frac{v^2}{r} = \omega^2 r$

ACCELERATION

$$\frac{dv}{dt} = r\frac{d\omega}{dt}$$

$$a_T = r\alpha$$

a_T = LINEAR ACCELERATION (m/s^2) (TANGENTIAL)

r = RADIUS (m)

α = ANGULAR ACCELERATION (RAD/s^2)

a_r = RADIAL ACCELERATION

ph

MER

JOG

(c

SH

PO

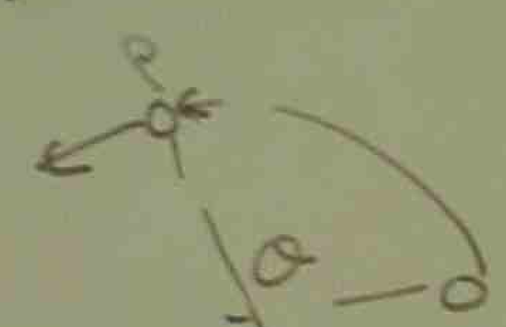
(a)

AN G

a_T

a_r

pb A COACHROACH RIDES THE RIM OF A ROTATING MERRY GO ROUND. IF THE ANGULAR SPEED IS CONSTANT, DOES THE COACHROACH HAVE (a) RADIAL ACCELERATION? (b) TANGENTIAL ACCELERATION? WHAT ANGLE Op SHOULD THE ARC SUBTEND SO THAT a IS 4g AT POINT 'p'



(a) $a_T = \frac{dv}{dt} = r\frac{d\omega}{dt}$

ANGULAR SPEED CONSTANT

$$\frac{d\omega}{dt} = 0$$

$$a_T = r\frac{d\omega}{dt} = r \times 0 = 0$$

(b) NO TANGENTIAL ACCELERATION

$$a_r = \omega^2 r$$

(a) IT HAS RADIAL ACCELERATION

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$

$$\alpha = \frac{a_t}{r}$$

$$\omega_0 = 0 \quad \theta_0 = 0$$

$$\omega^2 = 2\alpha\theta$$

BUT $\alpha = \frac{a_t}{r}$

$$\omega^2 = 2\frac{a_t}{r}\theta$$

$$\boxed{a_r = \omega^2 r}$$

$$\omega^2 = \frac{a_r}{r}$$

$$\frac{a_r}{r} = \frac{2a_t}{r}\theta$$

$a_r =$

$a =$

$\theta =$

$\theta - \theta_0)$

$a_r = 2 a_t \theta$

$a = \sqrt{a_t^2 + a_r^2} \rightarrow$

$$\boxed{\theta = \frac{1}{2}\sqrt{\frac{a^2}{a_t^2} - 1}}$$

$a = \sqrt{a_t^2 + (2a_t\theta)^2} = a^2 = a_t^2 + (2a_t\theta)^2 = (2a_t\theta)^2 = a^2 - a_t^2$

$2a_t\theta = \sqrt{a^2 - a_t^2}$

$\theta = \frac{1}{2a_t}\sqrt{a^2 - a_t^2}$

$= \frac{1}{2}\sqrt{\frac{a^2}{a_t^2} - \frac{a_t^2}{a_t^2}}$

$= \frac{1}{2}\sqrt{\frac{a^2}{a_t^2} - 1}$

$a = 4g$ (GIVEN)

$a_t = g$

$\theta_p = \frac{1}{2}\sqrt{\frac{(4g)^2}{g^2} - 1}$

$= 1.94$ RAD

$= 1.94 \times \frac{180}{\pi} = 111$

KIN

Ro

$$= (2at\,\theta)^2 = a^2 - at^2$$

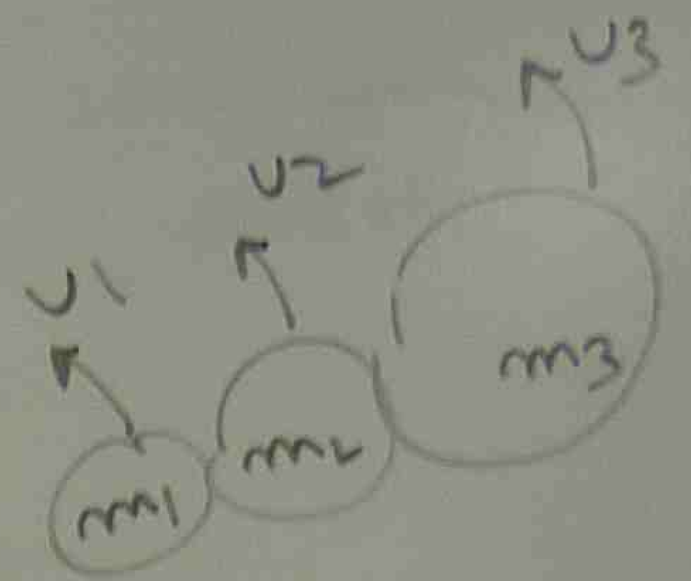
$$2a_t\,\theta = \sqrt{a^2 - at^2}$$

$$\theta = \frac{1}{2at}\sqrt{a^2 - at^2}$$

$$= \frac{1}{2}\sqrt{\frac{a^2}{at^2} - \frac{at^2}{at^2}}$$

$$= \frac{1}{2}\sqrt{\frac{a^2}{at^2} - 1}$$

KINETIC ENERGY OF ROTATION



K = KINETIC ENERGY

$$K = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 + \frac{1}{2} m_3 v_3^2$$

$$= \sum \frac{1}{2} m_i v_i^2$$

$$v_i = \omega r_i$$

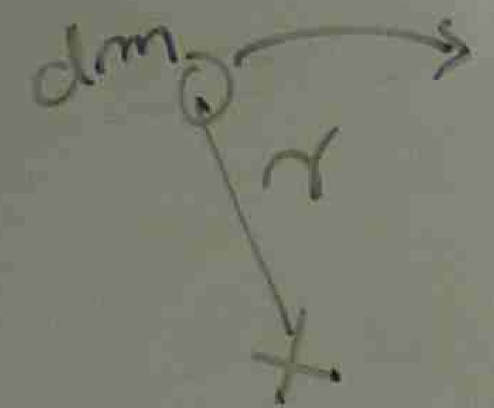
$$= \sum \frac{1}{2} m_i (\omega r_i)^2$$

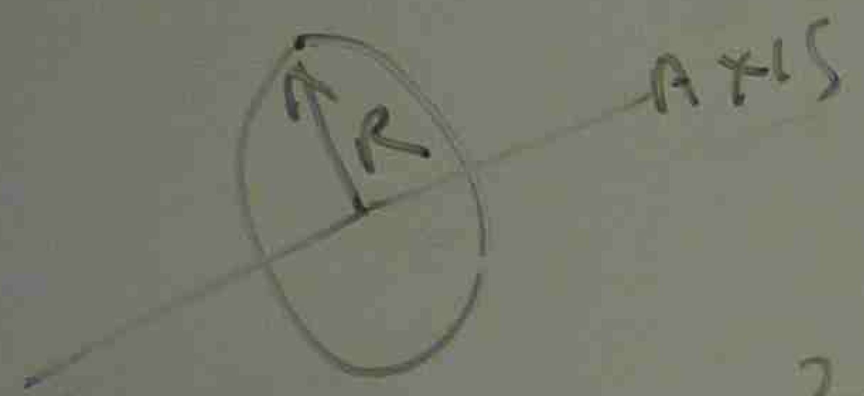
$$K = \frac{1}{2} \sum m_i r_i^2 \, \omega^2$$

ROTATIONAL INERTIA = $I = \sum m_i r_i^2$

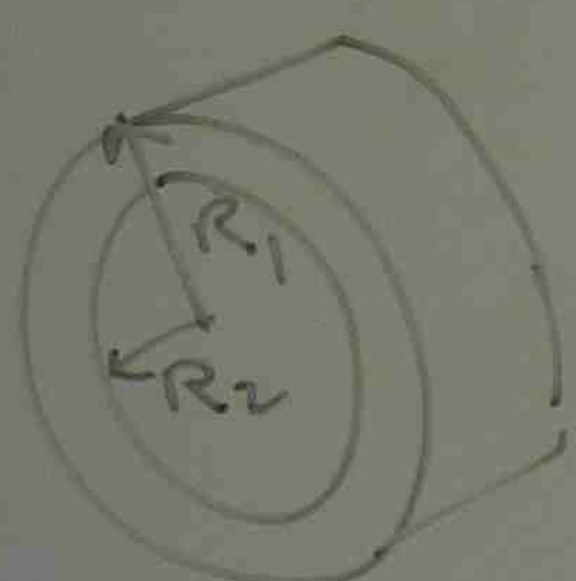
$$\boxed{K = \frac{1}{2} I \omega^2}$$

$$I = \int r^2 \, dm$$

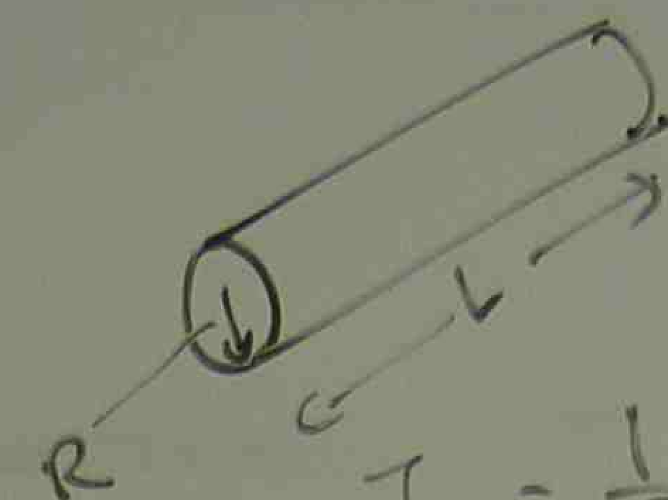




$$I = m R^2$$

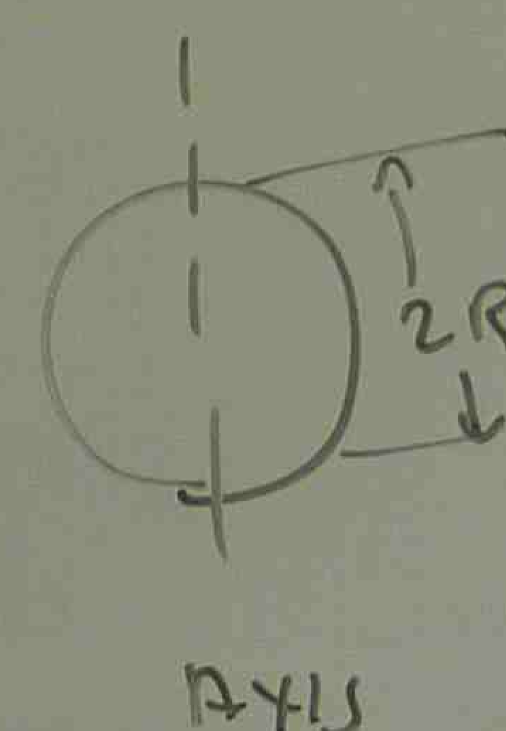


$$I = \frac{1}{2} m (R_1^2 + R_2^2)$$

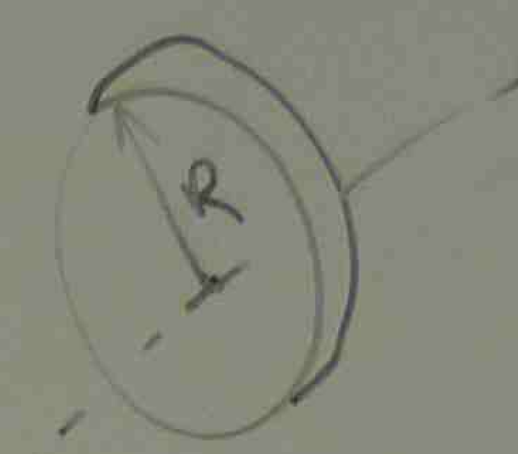


$$I = \frac{1}{2} m R^2$$

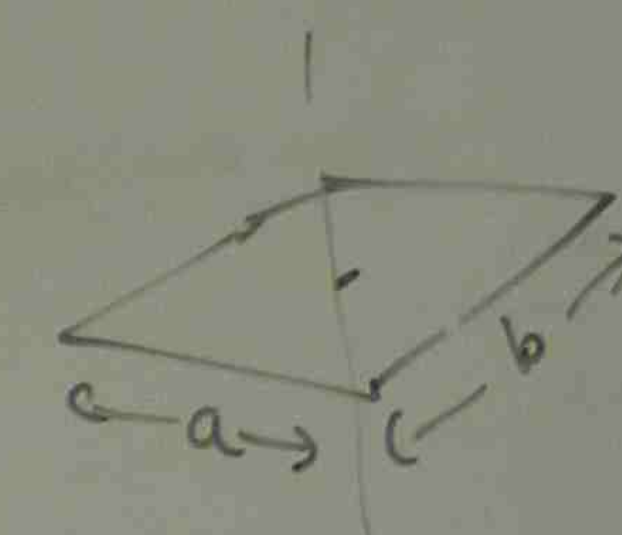
$$I = \frac{1}{12} m L^2$$



$$I = \frac{2}{5} m R^2$$

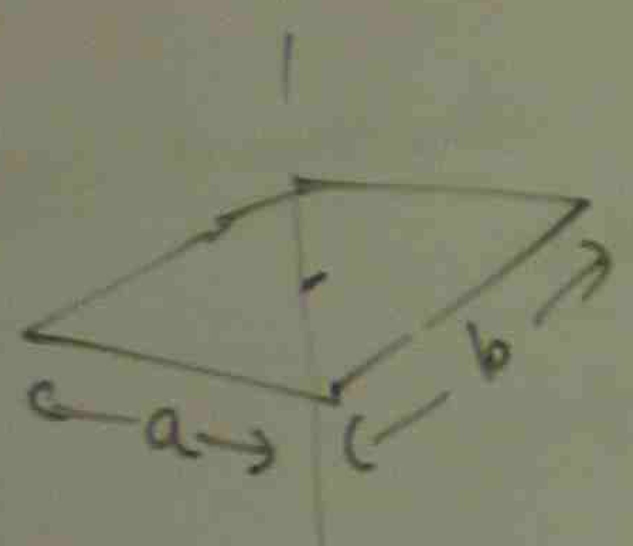


$$I = \frac{1}{2} m R^2$$



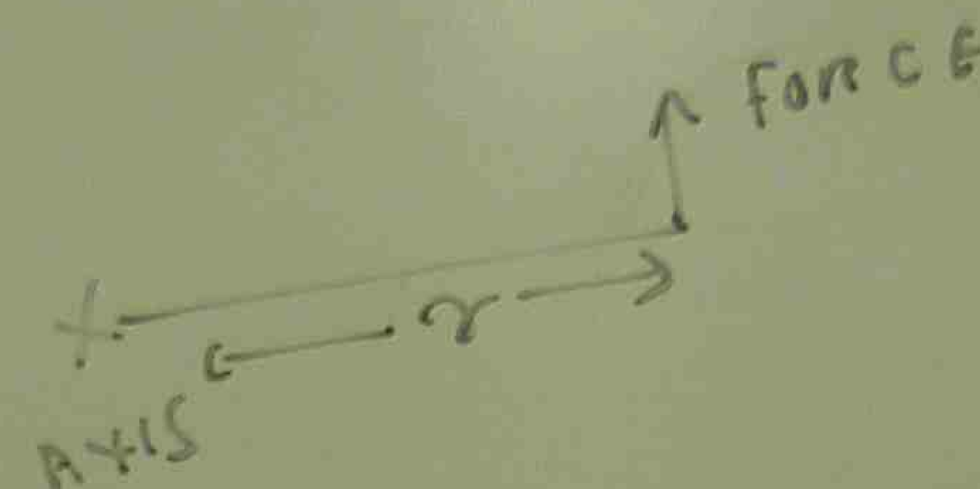
$$I = \frac{1}{12} m (a^2 + b^2)$$

$I = \frac{1}{2} m R^2$



$I = \frac{1}{12} m (a^2 + b^2)$

TORQUE



TORQUE = FORCE × DISTANCE

$\tau = F \times r$ (N- m)

$\tau = I \alpha$

I = INERTIA

α = ANGULAR ACCELERATION

$\tau = m r^2 \alpha$

pb

FIGURE SHOWS

m = 2.5 kg,

A BLOCK O

A MASS LESS

OF FALLI

T − m

a =

pb

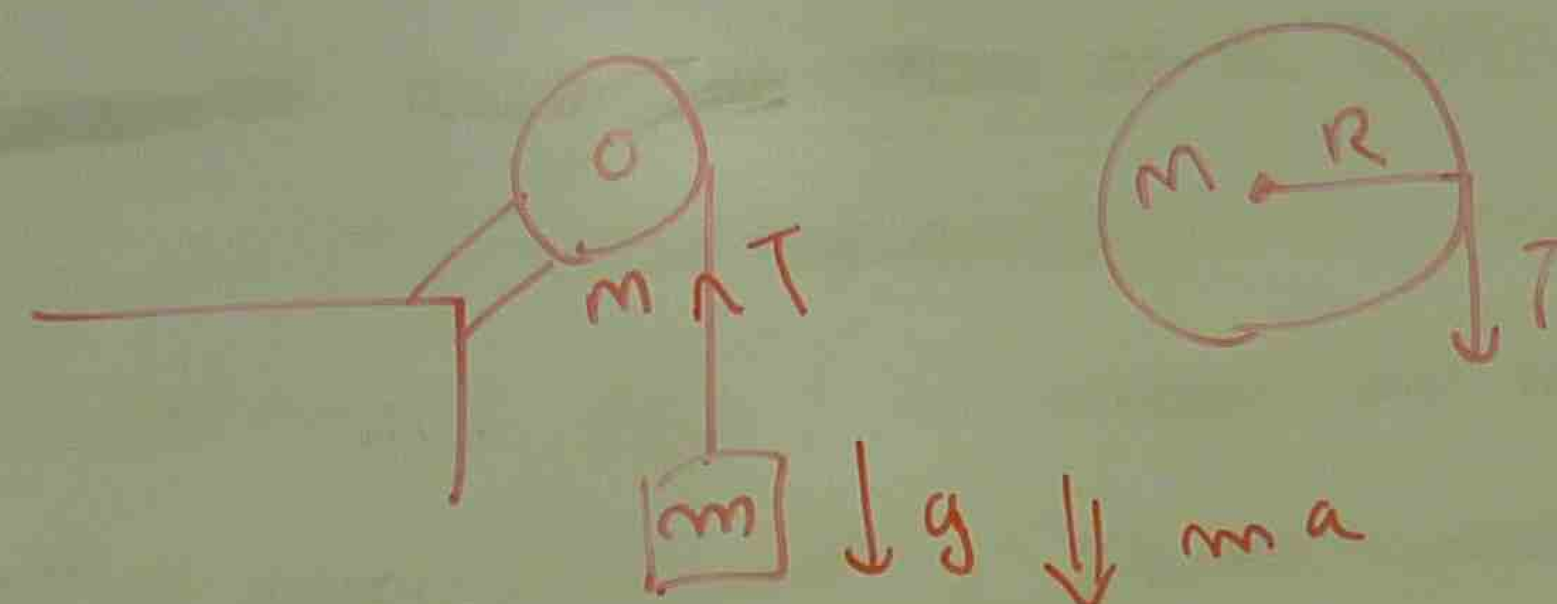


FIGURE SHOWS A UNIFORM DISK WITH MASS $M = 2.5\,kg$, $R = 20\,cm$.
A BLOCK OF $m = 1.2\,kg$ HANGS FROM A MASS LESS CORD. FIND ACCELERATION OF FALLING BLOCK.

$$T = M \times R$$

$$T - mg = ma$$

$$a = \frac{T - mg}{m} = \frac{MR - mg}{m}$$

$$= \frac{2.5 \times \frac{20}{100} - 1.2 \times 9.81}{1.2}$$

$$a = \frac{0.5 - 1.2 \times 9.81}{1.2}$$

$$= -9.39\ m/s^2$$

NCE

(u- m)

INERTIA

ANGULAR

ACCELERATION

TIA

AR

RATION

pb

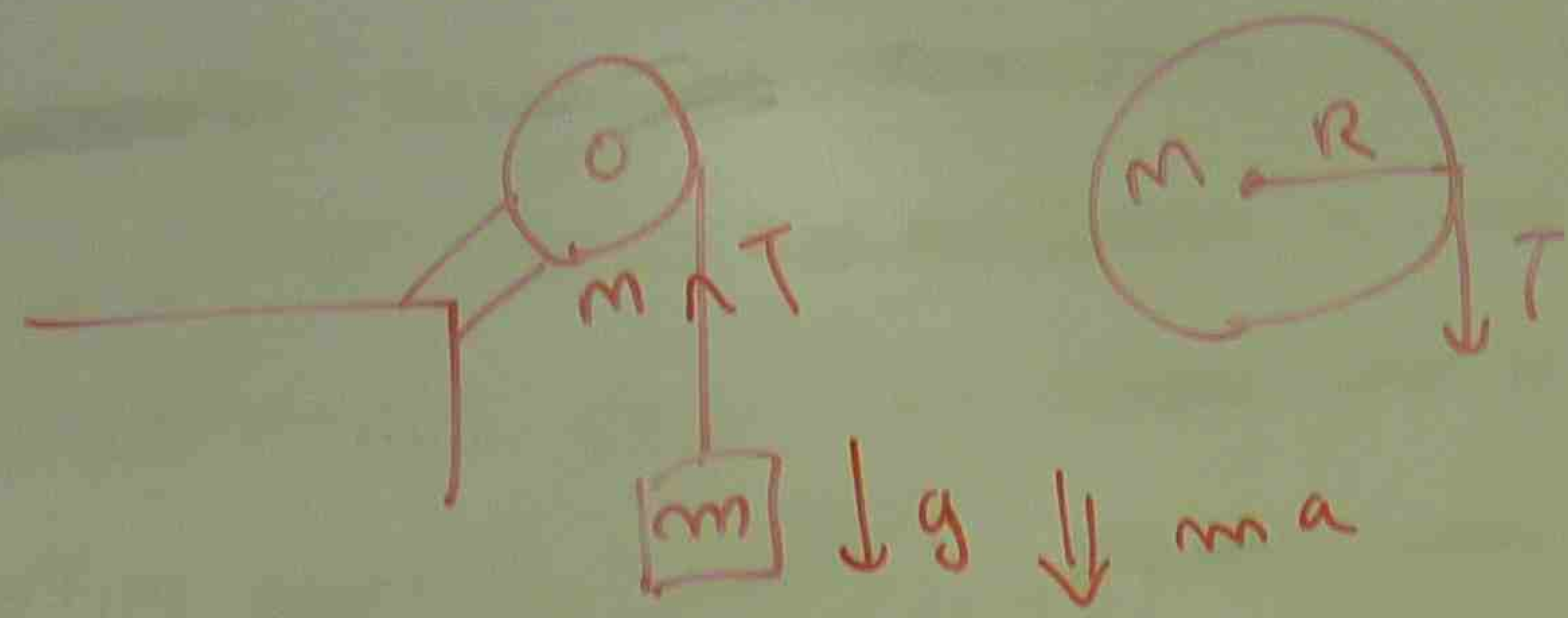


FIGURE SHOWS A UNIFORM DISK WITH MASS $m = 2.5\,kg$, $R = 20\,cm$. A BLOCK OF $m = 1.2\,kg$ HANGS FROM A MASS LESS CORD. FIND ACCELERATION OF FALLING BLOCK.

$$T = m \times R$$

$$T - mg = ma$$

$$a = \frac{T - mg}{m} = \frac{mR - mg}{m}$$

$$= \frac{2.5 \times \frac{20}{100} - 1.2 \times 9.81}{1.2}$$

$$a = \frac{0.5 - 1.2 \times 9.81}{1.2}$$

$$= -9.39\ m/s^2$$