PHYSICS PRACTICAL SHEETS

Date: 2078/06/11 Prime CAMPUS
Class: Bsc. CSIT Experiment No.: 1
Roll No.: Group:
Shift: Morning Sub.:
Object of the Experiment (Block Letter) Set:

30/11

TO DETERMINE THE MI OF A FLYWHEEL

APPARATUS REQUIRED:

i) A flywheel
ii) A few different masses and a mass provided with a hook.
iii) A strong and thin ray
iv) Stopwatch
v) A metre scale
vi) Vernier caliper
vii) A piece of chalk

THEORY:

A flywheel is simply a heavy wheel with a long axle supported in bearings such that it can rest in any position, C.G lies on the axis of rotation. The moment of inertia of flywheel about axis of rotation is given by:

$$I = \frac{2mgh - mr^2\omega^2}{\omega^2\left(1 + \frac{n}{n_1}\right)}$$

Where,

'm' is the mass ~~[illegible]~~ attached to axle of wheel
'h' is the height through which the mass has fallen.
'r' is the radius of axle

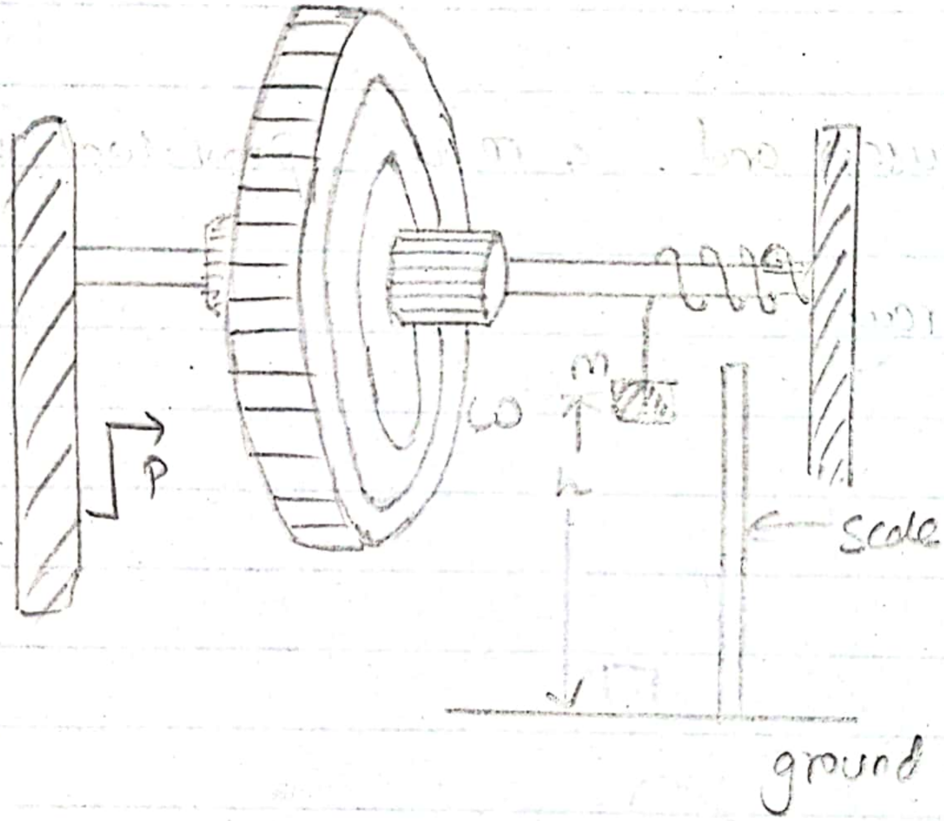

fig flywheel

'ω' = $\frac{4\pi n_1}{t}$ is angular velocity of wheel

'n_1' is no. of revolution made by wheel before coming to rest.
't' is time taken by wheel before coming to rest.
'n' is no. of turn of cord on the wheel which is also no. of revolution the wheel makes during the descent of mass 'm'.

OBSERVATIONS:

Vernier constant of vernier caliper (V.C) = 0.01
Least count of scale = 0.1 mm

Observation table for determination of radius of axle.

No. of obs	MSR (x)	VSR (V)	Value of V y = V × V.C	Total diameter D = x + y	Mean diameter (d)
1	3	0	0	3	3

Radius of axle = $\frac{d}{2}$ = 1.5 cm = 0.015 m

Circumference of wheel = 60 cm = 0.6 m.

Table for determination of MI:

SN	height 'h' in 'm'	mass 'm' in kg	No. of turns (n)	No. of complete revln (x)	Distance of chalk from pointer 'd' (in m)	fraction of revolution $y = d/c$	Total no. of rev. $(n_1) = x + y$	time taken 't' (s)	$\omega = 4\pi n_1/t$
1	0.82	0.2	7	47	0.205	0.341	47.341	61	9.74
2	0.75	0.4	6	92	0.215	0.358	92.351	82.5	14.06
3	0.665	0.6	5	102	0.2	0.333	102.33	90.85	14.14

Calculation:

$$I = \frac{2mgh - mr^2\omega^2}{\omega^2\left(1 + \frac{n}{n_1}\right)}$$

$$I_1 = \frac{2m_1gh_1 - m_1r^2\omega_1^2}{\omega_1^2\left(1 + \frac{n}{n_1}\right)}$$

$$= \frac{2 \times 0.2 \times 9.8 \times 0.82 - 0.2 \times (0.015)^2 \times (9.74)^2}{(9.74)^2\left(1 + \frac{7}{49.416}\right)}$$

$$= 2.96 \times 10^{-2}\ kgm^2$$

Similarly,

$I_2 = 2.78 \times 10^{-2}\ kgm^2$

$I_3 = 3.71 \times 10^{-2}\ kgm^2$

RESULT:

The moment of inertia for different masses is found to be 2.56×10^{-2} kgm², 2.78×10^{-2} kgm² & 3.71×10^{-2} kgm² respectively.

CONCLUSION:

By using formula, the moment of inertia of flywheel can be determined.

PRECAUTIONS:

i) The rope connecting the weight should be tight.
ii) The rope must be measured properly.
iii) The time should be measured properly.