Day: ______ Date: ______

Consider an elevator with a spring balance and mass m moving up with acceleration "a" then.

Net = Tension + − weight

~~$F_n = T - a$~~ $F_n = T - W$

$ma = T - W$

$ma + W = T$

$T = ma + W$

$T = W + ma$

$T = W + (\text{some value})$

$T > W$

Data:- **Q No 4**

speed = $1.01 Kms^{-1} = 1010 ms^{-1}$

radius = $390400 Km = 390400 \times 1000 m =$

find:-

How many days it will complete one revolution.

formula:-

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

$$T = \frac{2(3.14)(390,400,000)}{(1010)}$$

$$T = \frac{6.28 \times 390,400,000}{1010} = \frac{2.45 \times 10^9}{1010} = 2.425 \times 10^7$$

assignment:- week 4

Physics

Question No 1

Short Question:-

(i)

K.E of sphere:-

Consider a sphere rolling without splipping down along an inclined plane so that it has both translational as well as rotational motion. So it will have Both translational and rotational K.E.

$$K.E_{trans} = \frac{1}{2} mv^2 \qquad \text{For sphere: } I = \frac{2}{5} mr^2$$

$$K.E_{rot} = \frac{1}{2} I\omega^2$$

$$K.E_{rot} = \frac{1}{2} I\omega^2 = \frac{1}{2}\left(\frac{2}{5} mr^2\right)\omega^2$$

$$K.E_{rot} = \frac{1}{5} mr^2\omega^2 = \frac{1}{5} m(r\omega^2)$$

$$K.E_{rot} = \frac{1}{5} mv^2$$

Total K.E of the shpere.

$$K.E_T = K.E_{tran} + K.E_{rot} = \frac{1}{2} mv^2 + \frac{1}{5} mv^2 = \frac{5mv^2 + 2mv^2}{100}$$

$$K.E_T = \frac{7mv^2}{10}$$

$$K.E_T = \frac{7mv^2}{10}$$

Calculations for speed:-

let the sphere starts from the top of Inclined

Q No 2

$v = \sqrt{gR}$

$= \sqrt{9.8ms^{-2} \times 6.4 \times 10^6 m}$

$= 7.9 Kms^{-1}$

Q No 5

$r = \left(\frac{GMT^2}{4\pi^2}\right)^{1/3}$

$G = 6.673 \times 10^{-11} Nm^2/Kg^{-2}$

$\pi = 3.14$

$M = 6 \times 10^{24} Kg$

$r = \left(\frac{6.673 \times 10^{-11} Nm^2/Kg^2 + 6 \times 10^{24} Kg + (86400)^2}{4(3.14)^2}\right)^{1/3}$

$r = 4.23 \times 10^7 m$

$r = 42.3 \times 10^6 m$

find heigh:-

$r = R + h$

$h = r - R = 42.3 \times 10^6 - 6.4 \times 10^6$

$= 35.9 \times 10^6 m$

$= 3.59 \times 10^7 m$

Q No 3

$$\frac{L_s}{L_o} = \frac{2r_s^2}{5r_o^2} = \frac{2(1.74\times10^6)^2}{5(3.85\times10^8)^2}$$

$$= \frac{2\times1.74\times1.74\times10^{12}}{5\times3.85\times3.85\ 10^{16}}$$

$$= 0.0817\times10^{12-16} = 0.0817\times10^{-4}$$

$$= 8.17\times10^{-6}$$

$$\frac{L_s}{L_o} = 8.2\times10^{-6}$$

Ratio of spin angular momentum of moon about its axis to the the oribal angular momentum is 8.2×10^{-6}.

Qno 6

Data:- diametre $= 2.50m$

angle $= \theta = 6.6\times10^{-9}$

find:- $r = ?$

formula:- $S = r\theta$

Solution:- $\frac{S}{\theta} = r$

$$\frac{2.50m}{6.6\times10^{-9}} = r$$

$$r = 3.78\times10^{8}$$

plane of heigh h and reaches the bottom with speed. According law of conservation of energy.

P.E at the top = K.E at bottom

$mgh = \frac{7}{10} mv^2 \Rightarrow 10gh = 7v^2$

$\frac{10}{7} gh = v^2 \Rightarrow v^2 = \frac{10}{7} gh$

$v = \sqrt{\frac{10}{7} gh}$

Question No 7

Data:-

$r_o = 3.85 \times 10^8 m$

$r_s = 1.74 \times 10^6 m$

find:-

$\frac{L_s}{L_o} = ?$

solution:-

for spin angular momentum $= L_s = I_s \omega_2$

for orbital angular momentum $= L_o \; I_o \omega_2$

$\frac{L_s}{L_o} = \frac{I_s \omega_s}{I_o \omega_o}$

$I_s = \frac{2}{5} m r_s^2$

$I_o = m r_o^2$

putting these values

$\frac{L_s}{L_o} = \frac{I_s \omega_s}{I_o \omega_o} = \frac{\frac{2}{5} m r_s^2 \omega}{m r_o^2 \omega}$