Physics

Question no 7 :-
Given Data :-
Distance between earth and moon $= r_0 = 3.85 \times 10^8 m$

Radius of moon $= r_s = 1.74 \times 10^6 m$

To find :-
Ratio of spin and orbital angular momentum $= \dfrac{L_s}{L_o} = ?$

Solution :-
The spin angular momentum of the moon about its own axis is

$$L_s = I_s w$$

$$L_s = \dfrac{2}{5} m r_s^2 w \cdots$$

As for moon (sphere) $I_s = \dfrac{2}{5} m r^2$

$$L_o = I_o w$$

$$L_o = m r_0^2 w$$

$$\dfrac{L_s}{L_o} = \dfrac{\dfrac{2}{5} m r_s^2 w}{m r_o^2 w}$$

$$\dfrac{L_s}{L_o} = \dfrac{2}{5} \cdot \dfrac{r_s^2}{r_o^2}$$

Putting values, we get

$$\frac{L_s}{L_o} = \frac{2(1.74 \times 10^6)^2}{5(3.85 \times 10^8)^2}$$

$$\frac{L_s}{L_o} = \frac{6.05 \times 10^{12}}{7.37 \times 10^{17}}$$

$$\boxed{\frac{L_s}{L_o} = 8.2 \times 10^{-6}}$$

Question no 6:-
Given data:-

$$S = 2.50 \, m$$

$$r = 3.8 \times 10^8 \, m$$

To find:-

$$\theta = ?$$

Solution:-

As $S = r\theta$

$$\theta = \frac{S}{r}$$

Putting values, we get

$$\theta = \frac{2.50}{3.8 \times 10^8}$$

$$\boxed{\theta = 6.6 \times 10^{-9} \, rad}$$