HW
23/8/21

ODM CONNECT APP HOMEWORK

Q1. How much is the gravitational force that keeps an artificial satellite of mass 3500 kg in orbit around the earth at an altitude of 4900 km -

i) 19000N ii) 19500N iii) 13000N iv) 10000 N

Ans) Given:- Mass of artificial satellite = 3500 kg

Altitude = 4900 km

First find the acceleration due to gravity

$$g = (9.8\ m/s^2)\left(\frac{6400\ km}{6400\ km + 4900\ km}\right)^2 = 3.57\ m/s^2$$

Then, $w = mg = (3500\ kg)(3.57\ m/s^2) = 19500\ N$

Q2. The value of g is maximum -

i) at poles of earth ii) at equator of earth

iii) in a mine iv) at a high hill

Q3. A stone is thrown vertically upwards and caught at the point of ~~intersection~~ projection after 10 seconds. The time taken by the stone to reach the highest point is –

(i) 5 sec (ii) 10 sec (iii) 9.8 sec (iv) 4.9 sec

Ans) According to 2nd eqⁿ of motion,

$S_1 = \frac{ut - gt^2}{2}$ .... (i)

$S_2 = \frac{gt^2}{2}$ .... (ii)

Equating (i) and (ii),

$ut = gt^2$

$u = gt$

Now, according to the law of free fall, time of accent = time of descent

So, $2t = 10$ sec

$\therefore \boxed{t = 5 \text{ sec}}$

Hence, the time taken by the stone to reach the highest point is 5 sec.

Q4. The period of a satellite in a circular orbit of radius R is T, the period of another satellite in a circular orbit of radius 4R is –

(i) 4T (ii) T/4 (iii) 8T (iv) T/8

Ans) Given :- $T_1 = T$, $T_2 = ?$, $R_1 = R$, $R_2 = 4R$

$$T^2 \propto R^3$$

$$\frac{T_1^2}{T_2^2} = \frac{R_1^3}{R_2^3} \Rightarrow \frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2} = \left(\frac{R}{4R}\right)^{3/2}$$

$$\Rightarrow \boxed{T_2 = 8T}$$