

Find The radius of a geosynchronous orbit around earth

$$M_e = 5.97 \times 10^{24} \text{ kg}$$

$$T = 24 \text{ hr} \left(\frac{3600 \text{ s}}{1 \text{ hr}} \right) = 8.64 \times 10^4 \text{ s}$$

$$T^2 = \frac{4\pi^2 r^3}{GM} \rightarrow \frac{GMT^2}{4\pi^2} = r^3$$

$$r = \sqrt[3]{\frac{GMT^2}{4\pi^2}}$$

$$= \sqrt[3]{\frac{(6.67 \times 10^{-11} \frac{\text{Nm}^2}{\text{kg}^2})(5.97 \times 10^{24} \text{ kg})(8.64 \times 10^4 \text{ s})^2}{4\pi^2}}$$

$$= \sqrt[3]{7.53 \times 10^{22} \text{ m}^3}$$

$$r = 4.22 \times 10^7 \text{ m} = \boxed{42,200 \text{ km}}$$