Answer on Question #66050, Physics / Mechanics | Relativity

Question:

What should be the radius of a space station spinning with an angular speed of 2 rpm such that an astronaut inside the station experiences artificial gravity with g = 10 m/s^2?

Solution:

In this case artificial gravity occurs due to centrifugal force.

Therefore centrifugal acceleration $a_{cf} = \omega^2 R = g$, where ω — angular velocity and R — the radius of the space station.

$\omega^2 R = g \quad \Rightarrow R = \frac{g}{\omega^2}$.

$\omega = 2\ rpm = 2 \cdot \frac{2\pi}{60} s^{-1} = \frac{\pi}{15} s^{-1}$

$R = \frac{g}{\omega^2} = \frac{10}{\left(\frac{\pi}{15}\right)^2} = \frac{2250}{\pi^2} \cong 228\ m$

Answer:

$228\ m$