

Answer on Question # 69095, Physics – Mechanics - Relativity :

Question: The moon revolves around the earth making a complete revolution in about 27.3 days. If the radius of its orbit is 3.85×10^8 m, calculate the angular speed and tangential velocity of the motion. What are the angular and centripetal acceleration?

Solution: We know, 27.3 days = 2358720 seconds = 2.35×10^6 sec.

Radius of orbit (r) = 3.85×10^8 m (given)

$$\text{Angular speed (}\omega\text{)} = \frac{2\pi}{2.35 \times 10^6 \text{ sec.}} = 2.67 \times 10^{-6} \text{ rad/sec.}$$

$$\text{Tangential velocity (v)} = \omega \times r = 2.67 \times 10^{-6} \times 3.85 \times 10^8 = 10.2795 \times 10^2 = 1027.95 \text{ m/sec.}$$

$$\text{Angular acceleration (}\alpha\text{)} = \frac{2.67 \times 10^{-6}}{2.35 \times 10^6} = 1.14 \times 10^{-12} \text{ rad/sec}^2.$$

$$\text{Centripetal acceleration (a)} = \frac{v^2}{r} = \frac{1027.95^2}{3.85 \times 10^8} = 27.446 \times 10^{-4} \text{ m/sec}^2.$$

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