A communication satellite has a period, \( T_c = 1 \) day. The orbital radius \( r_c = 6.6 \, R \), with \( R \), the earth’s radius. A new satellite has its orbital radius \( r_{new} = \frac{r_c}{4} \).

Determine its period \( T_{new} \), in terms of \( T_c \). (Sketch is no drawn to scale)

A) \( T_{new} = \frac{r_{new}}{r_c} T_c \).

B) \( T_{new} = \left( \frac{r_{new}}{r_c} \right)^{\frac{3}{2}} T_c \).

C) \( T_{new} = \frac{r_c}{r_{new}} T_c \).

D) \( T_{new} = \left( \frac{r_c}{r_{new}} \right)^{\frac{3}{2}} T_c \).

\[
g = G \frac{M}{r^2}
\]

\[
g_1 = \frac{r_2^2}{g_2} = \frac{r_2^2}{r_1^2}
\]

\[
\frac{T_2}{T_1} = \frac{\omega_1}{\omega_2} = \sqrt{\frac{g_1 r_2}{g_2 r_1}} = \left( \frac{r_2}{r_1} \right)^{\frac{3}{2}}.
\]

\[
T_{new} = \left( \frac{r_{new}}{r_c} \right)^{\frac{3}{2}} T_c.
\]

Answer B

14.05-03’From one’Period to Another’Period 2004-3-24