A physical pendulum in constructed consisting of a disc with three smaller discs attached as shown in the drawing. The system is pivoted at P. The smaller discs are attached on the rim of the large disc at 90°, 180° and 270° from P. The mass of the large disc is 2.75 kg, and its radius is 0.300 m. The small discs have masses of 0.65 kg and radii of 0.090 m. Calculate the frequency of small angle oscillations, in Hz.

\[ M = 2.75 \text{ kg} \quad m = 0.65 \text{ kg} \quad R = 0.3 \text{ m} \quad r = 0.09 \text{ m} \]

For disk \( I_c = \frac{1}{2} mR^2 \)

\[
I = \frac{1}{2} MR^2 + mR^2 + \frac{1}{2} mr^2 + m(R^2 + R^2) + \frac{1}{2} mR^2 + mR^2 + mR^2 + mR^2
\]

\[
+ \frac{1}{2} mR^2 + m(2R)^2 = \frac{3}{2} MR^2 + \frac{3}{2} mR^2 + mR^2
\]

Due to symmetry \( x_c = 0 \) \( y_c = \frac{MR + mR + mR + m2R}{3m + M} \)

\[
d = y_c = \frac{4m + M}{3m + M} R
\]

\[
\omega = \sqrt{\left( \frac{(3m + M)g}{I} \right)^2} = \sqrt{\frac{Rg(4m + M)}{\frac{3}{2} MR^2 + \frac{3}{2} mR^2 + 8mR^2}} \]

\[
f = \frac{\omega}{2\pi} = 6.86 \times 10^{-4} \text{ Hz}
\]