Answer on Question #44568, Physics, Mechanics | Kinematics | Dynamics

Question:

A crank on an engine has rotating parts of mass 4.25kg, with a radius of gyration k = 59 mm. Determine the torque in Nm required to overcome the inertia of the rotating parts when angular acceleration is 36 rads/s2

Answer:

Newton's second law of motion adapted to describe the relation between torque and angular acceleration:

$$\tau = I\alpha$$

where τ – torque, I – moment of inertia, α – angular acceleration.

Moment of inertia equals:

$$I = mk^2$$

where m is mass, k is radius of gyration.

Therefore:

$$\tau = \alpha mk^2 = 36 \cdot 4.25 \cdot 0.059^2 \cong 0.533\ N \cdot m$$

Answer: $0.533\ N \cdot m$