Answer on Question #54205-Engineering-Mechanical Engineering

A goods train's diesel develops $P = 1500kW$ at the driving wheels when the train is travelling at $v = 80\frac{km}{h}$. The driving wheels have a diameter of $d = 2r = 1.1m$. Assuming there is no slip between wheels and rail calculate the torque at the wheels and the work done by the wheels in $l = 1\ kilometre$?

A. 422Nm, 987.9kJ B. 808Nm, 288MJ C. 1728Nm, 76.5kJ

D. 37125Nm, 6.75MJ E. 9842 Nm, 153MJ

Solution

The torque at the wheels is

$$T = Fr = \frac{P}{v}r = \frac{1500 \cdot 10^3 W \cdot 0.55m}{80\frac{1000m}{3600s}} = 37125Nm.$$

The work done by the wheels in 1 kilometre is

$$W = Fl = \frac{P}{v}l = \frac{1500 \cdot 10^3 W \cdot 10^3 m}{80\frac{1000m}{3600s}} = 6.75\text{MJ}.$$

Answer: D. 37125Nm, 6.75MJ.