Answer on Question #60988-Physics-Mechanics-Relativity

A Reciprocating Internal Combustion Engine (RICE) uses fuel of energy content 48.3 MJ/kg, at a rate of 6 kg/h. It is tested that the engine has the thermal efficiency of 25 %. Thus, determine: i) the power output in kilowatts

Solution

$$\frac{dE_{in}}{dm} = 48.3 \frac{MJ}{kg}$$

$$\frac{dm}{dt} = 6 \frac{kg}{h}$$

$$\eta = \frac{P_{out}}{P_{in}} = 0.25$$

The power output is

$$P_{out} = \eta P_{in} = \eta \frac{dE_{in}}{dt} = \eta \frac{dE_{in}}{dm} \frac{dm}{dt} = 0.25 \cdot 48.3 \cdot 10^3 \frac{kJ}{kg} \cdot \frac{6kg}{3600s} = 20.125 \ kW.$$

Answer: $20.125 \ kW$.