

TOPIC

Thermodynamics – Section XII – Question 6

QUESTION

Air is adiabatically compressed in a steady flow system from 1 bar to 5 bars. The air enters at 298 K and the compressor efficiency is 70 %. The work per unit mass of air required for the compression (in kJ/kg) most nearly is

- (A) 122
- (B) 174
- (C) 249
- (D) 1703

HINT

The steady state energy balance for this case is:

$$W/m = h_{in} - h_{out}$$

Where

W/m is work per unit mass and h is the enthalpy.

For an ideal gas with constant heat capacity (assumed here),

$$h_{in} - h_{out} = C_p(T_{in} - T_{out})$$

So that

$$W/m = C_p(T_{in} - T_{out})$$

CONTRIBUTOR

Scott Campbell