

Problem 1:

The turbine section of a Brayton cycle gas turbine receives the hot compressed air at 10 bar, 1200 K expands it to 1 bar and develops a gross power output of 10 MW. Air enters the compressor section at 1 bar, 300 K. Assume air behaves as a perfect gas with constant specific heat, $c_p=1$ kJ/kgK. Find:

- a) mass flow rate of air required
- b) compressor power output required
- c) net power output
- d) cycle efficiency
- e) compressor exit temperature required for maximum power output

Problem 2:

A dive shop worker fills a used SCUBA tank with the shop compressor. The tank volume is 3 m^3 , the initial tank pressure is 35 bar, and the initial temperature of the air is 290 K. If the compressor supplies air at 315 K and stops filling the tank at 225 bar, find:

- a) the heat transferred to the tank if the tank temperature remains constant throughout the fill.
- b) the final temperature of the tank if the tank is well insulated.

You may assume air is a perfect gas with $c_p=1 \text{ kJ/kgK}$.