

Quiz No. 1

This is a closed book quiz.

1. (10 pts) What is a thermodynamic property?

2. (10 pts) A system undergoes the following thermodynamic cycle.

process	energy transferred
1-2	240 kJ work into the system
2-3	850 kJ heat into the system
3-4	550 kJ work out of the system
4-1	?

Calculate the missing value and the thermodynamic efficiency of this cycle.

3. (40 pts) A piston cylinder device contains 0.5 kg of Oxygen at 20 C and 300 kPa. The Oxygen is compressed isothermally to a pressure of 1000 kPa.

- Sketch the system and show the process on a pV diagram.
- Calculate the heat and work transferred in kJ assuming ideal gas behavior.
- Calculate the entropy change of the Oxygen in kJ/K.

4. The turbine of a steam power plant operating on a simple ideal Rankine cycle produces 1500 kW of power. Steam enters the turbine at 5 MPa and 600 C with a velocity of 40 m/s and exits the turbine at 50 kPa with negligible velocity. Assume an isentropic expansion and a turbine efficiency of 100%.

- a. Sketch the system and show the process on a Ts diagram.
- b. Calculate the work transferred in kJ.
- c. Calculate the mass flow rate in kg/s.