Thermodynamics list 4

1. Calculate the absolute, technical and effective work of a process occurring within a cylinder knowing that this process is govern by $pV = 4 \cdot 10^5$. Known are: initial pressure $p_1 = 1{,}0MPa$, final pressure $p_2 = 0{,}1MPa$, ambietn pressure $p_0 = 950hPa$.
2. A vertical cylinder with movable piston, loaded with constant weight is filled with a gas. The gas enclosed within this cylinder changed its volume from $V_1 = 0{,}1m^3$ to $V_2 = 1m^3$ due to heat delivery. The manometric pressure of the gas is $p = 0{,}2\ MPa$. The increase of internal energy is $\Delta U = 3000kJ$. Calculate the heat delivered during the process (Q_{1-2}) knowing that the ambient pressure is $p_0 = 0{,}1\ MPa$.
3. Calculate the specific internal energy and specific enthalpy of a carbon dioxide at the temperature of 300℃. The gas should be considered as ideal.
4. Calculate the heat flux absorbed by a combustion engine with effective power of $N_e = 3000kW$. This engine consumes 30% of enthalpy flux for converting the fuel into the mechanical work, 35% is absorbed by the water for engine cooling.
5. Calculate the power of an ideal piston engine with swept volume of $V_s = 0{,}04m^3$ in which gas decompresses from $p_1 = 0{,}9\ MPa$ to $p_2 = 0{,}1\ MPa$. The cylinder filling is complete when the piston traveled x=20% of total swept distance. The process of the gas within the engine can be expressed as rectilinear dependence p(V). The rate of rotation is $\omega = 20s^{-1}$.
6. Helium has undergone a reversible isobaric process from the stage: $p = 7bar,\ t_1 = 20$℃, $V_1 = 15dm^3$ to the stage where $t_2 = 827$℃. Considering this gas as perfect calculate:
   - The absolute work of the process,
   - The amount of heat delivered to the medium ,
   - The technical work,
   - The change of internal energy.
7. Oxygen has undergone a reversible isobaric process from the stage: $p = 4bar,\ t_1 = 20$℃, $V_1 = 30dm^3$ to the stage where $V_2 = 180dm^3$. Considering this gas as perfect calculate
   - The temperature of the oxygen after the process,
   - The absolute work of the process,
   - The amount of heat delivered to the medium .
8. Ammonia with mas of 1,2 kg was isovolumic cooled form $t_1 = 300$℃ to the stage where $t_2 = 50$℃, $p_2 = 0{,}4\ bar$. Considering ammonia as perfect gas calculate:
   - The volume of the medium,
   - The pressure at the beginning of the process,
   - The amount of heat delivered into the medium,
   - The change of internal energy.