Problem No. C1 (Ideal Reheat Rankine Cycle)
Consider a steam power plant operating on the ideal reheat Rankine cycle. Steam enters the high pressure turbine at 600ºC and 15 MPa and is condensed in the condenser at a pressure of 10 kPa. Assume the steam is reheated to the same temperature as in inlet of the high-pressure turbine. If the moisture content of the steam at the exit of the low-pressure turbine is not to exceed 10.4%, determine

a) the pressure at which the steam should be reheated
b) the thermal efficiency of the cycle.

Problem No. C2 (ideal regenerative Rankine cycle with OFH)
Consider a steam power plant operating on the ideal regenerative Rankine cycle with one open feedwater heater. Steam enters the turbine at 600ºC and 15 MPa and is condensed in the condenser at a pressure of 10 kPa. Some steam leaves the turbine at a pressure of 1.2 MPa and enters the open feedwater heater. Determine the fraction of steam extracted from the turbine and the thermal efficiency of this cycle.

Problem No. C3 (ideal reheat-regenerative Rankine)
Consider a steam power plant operating on the ideal reheat-regenerative Rankine cycle with one open feedwater heater, one closed feedwater heater and one reheater. Steam enters the turbine at 600ºC and 15 MPa and is condensed in the condenser at a pressure of 10 kPa. Some steam leaves the turbine at a pressure of 4 MPa for the closed feedwater heater while the rest of the steam under the same (4 MPa) pressure is reheated to 600ºC. The extracted steam is completely condensed in the heater and is pumped to 15 MPa before it mixes with the feedwater at the same pressure. Steam for the open feedwater heater is extracted from the low-pressure turbine at a pressure of 0.5 MPa. Determine the fractions of steam extracted from the turbine and the thermal efficiency of this cycle.

Problem No. C4 (simple ideal Brayton cycle)
A stationary power plant operating on an ideal Brayton cycle has a pressure ratio of 8 ($r_p:=p_2/p_1$). The gas enters the compressor at 300 K and the turbine at 1300K. Utilizing the air-standard-assumptions determine

a) the gas temperature at the exits of the compressor and turbine
b) the back work ratio ($r_{bw}:=w_{compressor,in}/w_{turb,out}$)
c) thermal efficiency.

Remarks: For values regarding ideal-gas air properties download thermodynamic tables from www.oxyfuel.eu. For explanation what air-standard-assumptions are download study materials from www.oxyfuel.eu.

Problem No. C5 (a combined gas-steam power cycle)
Consider a gas-steam ideal power cycle. Gas cycle has a pressure ratio 8 ($r_p:=p_2/p_1$). Air enters the compressor at 300 K and the turbine at 1300K. The isentropic efficiency of the compressor is 80% and that of a gas turbine 85%. The steam power cycle is simple ideal Rankine cycle operating between the pressure limits of 7 MPa and 5 kPa. Steam is heated in a heat exchanger by the exhaust gases to a temperature of 500ºC. The exhaust gases leave the heat exchanger at 450 K. Determine

a) the ratio of the mass flow rates of the steam and the combustion gases
b) the thermal efficiency of the combined cycle.