Assignment 12

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

NOTE: Only the attached choice table and refrigeration tables (R1-13A) should be used.

Common data for questions 1 to 4
In a Rankine cycle, saturated water vapor enters the turbine at 180 kPa, 380°C with a mass flow rate of 7.3 kg/s and exits at 80 kPa. Saturated liquid water enters the pump at 80°C. Cooling water enters the condenser at 18°C and exits at 28°C with a 5°C temperature drop.

For the cooling water, take \( C_p = 4.18 \text{ kJ/kg} \cdot \text{K} \), and the steam/liquid (pump efficiency) is 88%.

1. The power developed by the turbine _______ MW (Correct up to 2 decimal places)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 7.5, 8.0
   - 4 points

2. The power required by the pump _______ MW (Correct up to 3 decimal places)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 6.030, 6.090
   - 4 points

3. The thermal efficiency of the cycle is _______ %. (Correct up to 3 decimal places)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 10.05, 10.09
   - 4 points

4. The mass flow rate of cooling water is _______ kg/s (Correct up to 2 decimal places)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 21.0, 23.0
   - 4 points

Common data for questions 5 to 10
In a simple Rankine cycle, the pressure ratio is 1 and temperatures at the entrance of compressor and turbine are 298 K and 1256 K respectively. Both compressor and gas turbine have isentropic efficiencies equal to 0.90. For the gas, assume a constant value of \( C_p \) specific heat at constant pressure equal to 1.3 kJ/kg K and ratio of specific heats \( 1.4 \).

Neglected changes in kinetic and potential energy.

5. The temperature at the end of compression is _______ K. (Round off to the nearest integer)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 400, 450
   - 4 points

6. The power required by the compressor in kJ/kg of gas flow rate is _______ (Round off to the nearest integer)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 144, 154
   - 4 points

7. The work output from the gas turbine in kJ/kg of gas flow rate is _______ (Round off to the nearest integer)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 544, 554
   - 4 points

8. The thermal efficiency of the cycle is _______ % (Correct up to 2 decimal places)
   - No, the answer is incorrect.
   - Accepted Answers: [State: Range] 20.0, 22.0
   - 4 points

Common data for questions 11 and 12
A refrigeration based on ideal vapor compression cycle operates between the temperature limits of -20°C and 45°C. The refrigerant (R1-13A) enters the condenser as saturated vapour and leaves as saturated liquid.

If refrigeration evaporator rate is 0.03 kg/s, the refrigeration effect is equal to _______ kW. (Correct up to 2 decimal places)

- No, the answer is incorrect.
- Accepted Answers: [State: Range] 2.3, 2.5
- 4 points

10. The COP of the refrigeration is _______ (Correct up to 3 decimal places)
    - No, the answer is incorrect.
    - Accepted Answers: [State: Range] 3.04, 3.14
    - 4 points