

Xavier Nguyen
MET 350 Thermal Applications
Exam Two Test Reflection

WRITING RUBRIC (Applied to the whole test, not to particular problems)

Purpose	0.5/10.0
Drawings	1.0/10.0
Sources	1.0/10.0
Design considerations	1.0/10.0
Data and variables	0.5/10.0
Procedure	2.0/10.0
Calculations	2.0/10.0
Summary	0/10.0
Materials	0 /10.0
Analysis	1.0/10.0
TOTAL	9/10.0

Rubric

PROBLEM 1)

P-v and T-s diagrams	2/18
State calculations (11 of them)	3/18

PART 1)

Calculate y6, y7, and y9	0.5/18
Net work	1/18
Thermal efficiency	0/18

PART 2)

Realize that y7 is zero and that 4=5	2/18
Calculate y6, and y9	1/18
New Net Work and Thermal efficiency	1/18
Final results	2/18

TOTAL 12.5/18

FINAL GRADE:

$$9/10 + (80)*(12.5/18) = 56.45$$

When comparing the results of my exam to the exam solutions, it was an improvement on exam one. I did my best to follow the exam rubric. I went in-depth into the design considerations, discussing the various parts of the steam power plant and their costs. I also went in-depth on safety considerations and how to prevent injuries in a steam plant. Overall, my diagrams had the same shape as those in the solution, and the calculations were very similar to the exam solutions.

1) How and why the test demonstrates your work toward one or more of the course learning objectives. Be specific about the course objectives you decide to mention.

The test demonstrates a regenerative steam cycle with a steam trap and describes the need to determine the h-values for all states, the thermal efficiency, and the net work. The test actively uses diagrams to find the enthalpy and entropy required to find the net work and thermal efficiency of a steam cycle. My work showcases my understanding of the diagrams required, tables used, and the procedure to find the solution.

2) How does your test compare against the available solution? State the mistakes you made and what you will do next time to avoid making the same mistakes. Please point out exactly where you made the mistake, say why you made the mistake, and how you should have done it. If you were taking this test again, what advice would you give yourself to ensure that you had a successful test?

The mistake I made was in the calculations for finding states 7a and 7b. While the calculations for states 1-9 were correct, I incorrectly found the wrong h_{7a} and h_{7b} values. I knew that a steam trap was isenthalpic so $h_{7a} = h_{7b}$. However, I misinterpreted the quality. The problem stated that the water leaving the steam trap is a saturated liquid. Because you know the quality of state 7b, you should find that state first because $h_{7b} = h_{7a}$ as you do not know the quality of state 7a. However, I misinterpreted and put saturated liquid for state 7a. Because of that, the wrong h_{7b} value was found. To avoid this issue, it's important to read the problem and put the associated state at the correct value.

Because of that, finding the net work and thermal efficiency was wrong because the h_{7a} value was also wrong. While the other calculated values were correct, the one wrong value threw the solution off, creating an error carried forward.

Discuss the following:

a. What issues did you encounter in completing the test? How did you troubleshoot them?

The main issue I had regarding the exam was finding enthalpy for states 7a and 7b. This is because I got confused on which state was saturated liquid. Condition b3 of the problem states that: Condensate from the close FWH is drained through a trap to the open FWH and the water leaving the trap is saturated liquid. This means that state 7b should be saturated liquid. However, condition d says: The flows from the extraction points in the turbine are controlled in such a way that the feedwater leaves the condenser, the open FWH, and the close FWH as saturated liquid. I got confused because in the diagram, state 7a also leaves the closed feedwater heater so I assumed both states were saturated liquid which led to me obtaining the wrong answer.

I troubleshooted this issue by trying to rationalize that both could be saturated liquid, which was false. Ultimately, only state 7b was saturated liquid while state 7a was not.

b. What steps did you take to complete the whole test? Would you change something?

While working on the exam, I evenly distributed my time. I would work on the diagram and calculations on one day, and if I got stuck trying to find a value, I would take a break and then solve it the next day. Although I turned the exam in at the last minute, I finished it on time. The only thing I would try to change is to spend more time on the exam and review my answers before turning them in. If I had used more time to turn it in, I would have caught my mistake in finding state 7a and 7b.

c. What new concepts have you learned?

I learned the concepts of a regenerative Rankine cycle and how to use tables to find enthalpy and entropy values for saturated and superheated liquids.

d. Where do you think engineers use those concepts (provide specific examples)?

As stated in the problem, engineers can use these concepts to design a steam cycle for a power plant. Another example is using a Rankine cycle in power generation for coal, nuclear, or biomass plants. Creating a Rankine cycle requires knowledge of what parts you're using and where each part will be located. For example, if a steam power plant wants a very high thermal efficiency, an engineer can design in by installing many water heaters to raise the temperature entering the boiler.

e. Where do you think you will be using everything you learned?

I will be using everything I learned in my future career as a naval engineer. Although Rankine cycles are more commonly used in power plants, they can also be used for waste heat recovery on ships. Waste heat recovery increases energy efficiency and reduces fuel consumption by 10-15%.

f. Do you think what you learn is important for your professional career?

What I'm learning right now is important for my professional career. Learning about different cycles and how they work can expand my knowledge in different areas.

g. How, when, where, and why you might use this information or skill in the future?

I will apply the concepts I have learned in my current workplace. Although I work as a naval engineer, knowing about Rankine cycles is useful for learning about waste heat recovery, one way to save energy on ships. In arctic and low-temperature operations, a Rankine cycle can improve the ship's thermal efficiency.

Have you applied concepts you have learned in the course to what you do at work or in other courses?

As of right now, I have not. However, I see some of the concepts learned being used in future classes, such as my senior design project.

i. What areas did you feel you were most successful in, or improved the most?

I improved in using the different saturated and superheated tables to find entropy and enthalpy. One trouble I originally had was finding the different mass fractions. However, using the first law can make it doable, although tedious. I am very successful in finding work for the turbine and all the pumps.

j. How do you see this course's content intersecting with your field or career?

Pursuing a naval engineering career requires extensive knowledge of thermal systems, as many systems rely on them. Regarding the Rankine cycle, it is used in steam engines. In ships with a steam engine, the Rankine cycle is used to propel the ship forward.

k. How much time did you spend on the test? How was the time organized? What would you do differently? Why?

Overall, I used all the time allotted to me to complete the exam. I evenly spaced out my time to ensure I did not spend one night rushing to complete the exam. If I got stuck on one particular part of the problem, I would take a break and then resume the next day. Since I have other classes and obligations, I sometimes have to prioritize other assignments over the exam when they are so close to the due date. In the future, I prioritize other assignments before the exam is posted so I can get them out of the way and focus on the exam.