Test 1 focused on the thermodynamic analysis of Brayton cycle systems (question 1) and turbojet engine performance (question 2). The purpose of the assignment was to apply concepts such as compressor and turbine processes, regeneration, intercooling, and efficiency analysis to evaluate different engine configurations. Overall, the test required both thermodynamic principles and technical writing.One aspect that I believe I did well on was the procedure section. I started by identifying the known data and defining the states of the cycles before attempting any calculations, drawings, or any other steps.

However, there are several areas where my work could be improved. Some of my explanations were over written compared to the solutions. So it could have been written concisely in my opinion after looking at the solutions. Especially when discussing design considerations and the reasoning behind certain results. For example, the question about why the regenerator was ineffective required a clearer and more straight answer. A regenerator only improves efficiency when the turbine exhaust temperature is higher than the compressor exit temperature. If the compressor exit temperature becomes higher, heat cannot flow from the exhaust gases to the compressed air, which makes regeneration ineffective and can even decrease cycle efficiency.

Another area that could be improved is the p-v and t-s diagram for two stage compression as I got them wrong as I forgot to add the second stage in the diagram. Making the drawing look almost exactly the same as single. For Problem 2, the main challenge was drawing p-v and t-s diagrams correctly. While I understood the general turbojet process and was able to apply relationships such as w_c=w_t and the compressor and turbine efficiencies, I struggled with representing the cycle properly on the thermodynamic diagrams. After reviewing the solutions, I realized that my diagrams did not correctly reflect the process path and state relationships, which made it harder to clearly visualize the cycle. For the calculation, problem 1 is correctly done and the same calculations or the answer is off by a few percent due to different rounding. While problem 2 the answers were off by few, but not extremely wrong. See below for my calculation and its % differential.

Table 1. Percent differential between Teacher solutions and student calculations

| Design | W_net | % Diff | q_in | % Diff | η_th | % Diff | ε | % Diff |
|---|---|---|---|---|---|---|---|---|
| Case A | 236.35 | 0.00423083 | 529.95 | 0.001886935 | 0.446 | 0 | 1.34 | 0.074683 |
| Case B | 236.35 | 0.00423083 | 490.3 | 0 | 0.48 | 0.414938 | 0 | 0 |
| Case C | 236.55 | 0.00422726 | 504.96 | 0.001980316 | 0.468 | 0 | 0.511 | 1.960784 |
| Case D | 282.61 | 0.75941244 | 576.21 | 0.371028428 | 0.49 | 0.409836 | 0.5 | 0 |
| Case E | 282.56 | 0.55873875 | 529.95 | 0.001886935 | 0.533 | 0.566038 | 0.926 | 0.430108 |
| | | | | | | | | |
| Case b. | 236.36 | | 490.3 | | 0.482 | | 0 | |
| Case a. | 236.36 | | 529.96 | | 0.446 | | 1.339 | |
| Case c. | 236.56 | | 504.97 | | 0.468 | | 0.51 | |
| Case d. | 280.48 | | 574.08 | | 0.488 | | 0.5 | |
| Case e. | 280.99 | | 529.96 | | 0.53 | | 0.93 | |

*All the calculation were done in Microsoft Excel using the formula

=((My calculation - Solution)/Solution)*100.

Grading:

Purpose: 0.5/0.5

The objective of each problem was clearly stated before starting the analysis. I explained what needed to be determined, including cycle performance parameters and turbojet thrust.

Drawings: 0.5/1

I included diagrams for the Brayton cycle, but for Problem 2 my P-v and T-s diagrams were not fully correct, which affected how clearly the process was represented.

Sources: 1/1

Thermodynamic relations and air property tables used in the calculations were consistent with course materials and lecture references.

Design considerations (assumptions, safety, cost, etc): 1/1

I discussed the different Brayton cycle design cases and considered factors such as efficiency, system complexity, and feasibility of the regenerator. It could have been written clearer, but it meets the rubric requirement, so i give it a full mark.

Data and Variables: 0.5/0.5

All relevant given data such as temperatures, pressures, efficiencies, and cycle parameters were clearly identified and used in the calculations.

Procedure: 2/2

The solution followed a logical sequence: state determination, thermodynamic relations, and performance calculations. Some steps could have been explained more clearly, but again it meets the full credit requirement if I were to grade it.

Calculations: 1.8/2

Most calculations were shown and the results were very close to the provided solutions. Small numerical differences occurred but the approach was correct. I deducted little points on minor mistakes instead of following the rubric to the maximum.

Summary: 0.5/0.5

Final results were presented, meeting the required details for the section.

Materials: 0.5/0.5

All materials and working assumptions (air as working fluid, constant or variable specific heats, efficiencies) were clearly identified. Even named materials/equipment that wasn't needed, so over completed this section.

Analysis: 1/1

The results were analyzed when comparing the different design cases, met the required details described in rubric.

Total: 9.3/10

| | Self Grade | Rubric |
|---|---|---|
| Purpose | 0.5 | 0.5 |
| Drawings & Diagrams | 0.5 | 1 |
| Sources | 1 | 1 |
| Design considerations (assumptions, safety, cost, etc) | 1 | 1 |
| Data and variables | 0.5 | 0.5 |
| Procedure | 2 | 2 |
| Calculations | 1.8 | 2 |
| Summary | 0.5 | 0.5 |
| Materials | 0.5 | 0.5 |
| Analysis | 1 | 1 |
| | | |
| Total | 9.3 | 10 |

Problem 1:

| | Self grade | Rubric |
|---|---|---|
| Single Stage Compression (p-v and t-s diagram) | 1 | 1 |
| Two stage of Compression (p-v and t-s diagram) | 0.5 | 1 |
| Single stage compression (calulations) | 4 | 4 |
| Two stages of compression (calculations) | 2 | 2 |
| Why does regeneration hur in original case? | 1 | 1 |
| w_ner, q_in, thermal efficiency | 2 | 2 |
| HW effectivness | 1 | 1 |
| Which case is better | 1 | 1 |
| Final results | 1 | 1 |
| | | |
| Total | 13.5 | 14 |

Problem 2:

| | Self grade | Rubric |
|---|---|---|
| P-v and t-s diagrams | 1 | 2 |
| Calculations | 3.8 | 4 |
| Thurst | 1 | 1 |
| Final results | 1 | 1 |
| | | |
| Total | 6.8 | 8 |

Final Grade:

| | | |
|---|---|---|
| Final Grade | 81.8714286 | |