

ECE-298-CLA Evaluation of Exam 1

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Summary of Student performance on Exam 1

ECE 298-CLA is being taught for the first time in Spring 2019. The hope is to give instructional relief to students taking ECE 210 and 310, in the area of complex analysis, especially Laplace transforms, and matrix computations of complex variables. The class is organized around functions of the complex variable $s = \sigma + \omega j$, which is denoted the *Laplace frequency*. The class web page may be found at <https://auditorymodels.org> (click on the link at the left ECE298-CLA S2019).

The first exam for 298-CLA was taken by 24 of the registered 27 students. The exam was given on April 5 from 7-9:45 PM. The first student returned the exam almost exactly 1 hr into the exam. The last at 9:45. The students were given the solution to the exam once they handed in their exam. Since exact points were given for each of the eight problems, in theory it was possible for each student to compute their grade, and I requested that they do so.

The graded exams were returned one week later (April 12). On Monday, April 15, an initial version of this report was posted on the class website, with the distributions of scores on the exam. On April 19 the analysis was extended to include the distributions of each of the eight problems, as discussed next.

There were eight problems on the exam:

1. (14 pts) Primes and the *greatest common divisor* (GCD)
2. (8 pts) Pythagorean triplets
3. (8 pts) Continued fractions (CFA)
4. (8 pts) 2x2 Matrix solution to Pell's equation
5. (8 pts) 2x2 Matrix solution to Fibonacci equation
6. (15 pts) Eigenvalue decomposition (diagonalization) of a 2x2 matrix
7. (15 pts) 2-port transmission (ABCD) matrix analysis
8. (10 pts) History (400 BCE–1720 CE)

Problem 7 was not on any homework. While writing the initial report, it came to my attention that problem 7 (circuit analysis using the transmission matrix method), was not following my stated rule, that all the problems on the exam would come from homeworks.

While I had lectured on the transmission matrix method in class on March 25 (Lecture 4), there were no assignments given on the technique. The topic of transmission line T matrix analysis is dealt with in Problem 2 of Assignment DE-3 (final HW), assigned on Lecture 16, April 22, due May 1 on the last day of class.

By analyzing the individual problems, I wanted to see how the students did on problem 7, compared to the others. The clear answer is *not very well*. These distributions are shown in Fig. 1, as discussed next.

As a result of this analysis I have decided to re-score the exam with problem 7 removed. Testing on this topic should be rescheduled for the final exam.

Grade distribution across the eight problems: Figure 1 shows histograms of the 24 student scores for the 8 problems. As noted, the scores for problem 7, on the transmission matrix circuit analysis method, did not appear on any of the homeworks prior to the exam. Thus problem 7 had notably low scores. The details are provided in Table 1.

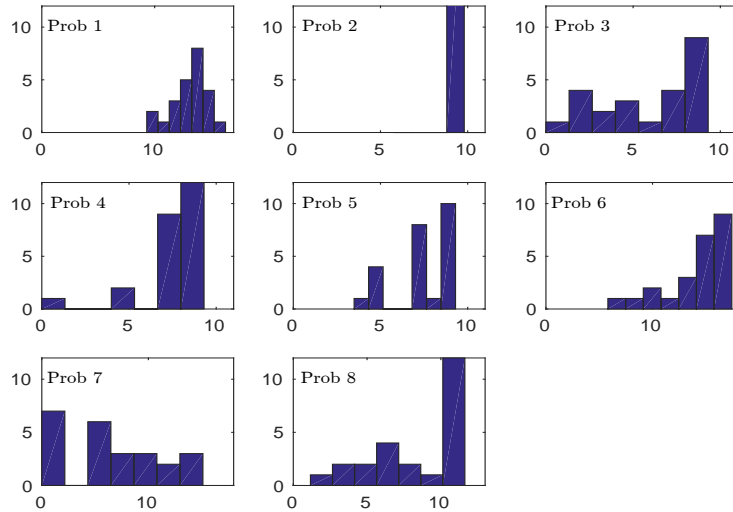


Figure 1: Histograms of the grades for Exam I. The weights on each of the three components will be HW (25%), Exam I (25%), Final Exam (50%). These weights were changed because following HW-1, I modified the homework to include the solution to each problem, thus I increased the weight of the HW to 25% to reflect this change. The abscissa ranges from 0 to the maximum score plus 2, to give room for the width of the histogram bars. Seven bins divide the 24 students (3:1 overlap bin quantization).

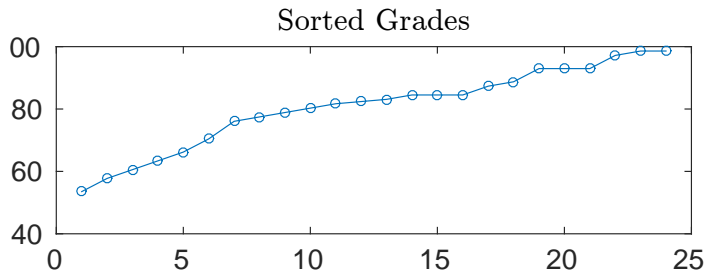


Figure 2: Sorted distribution of grades for Exam I after removing Problem 7. The maximum mean score was normalized to 100 [%]. These scores are notably higher for everyone, than those with Problem 7 included.

Grade distribution across 24 students Figure 3 shows the distribution of the final grades after removing Problem 7. The question of the transition from A- to B+ is still open, but appears to be at 66%, with A- at 72%.

Table 1 gives a summary of the grade distribution for the HW. The numbers along the first row identify the problem number (1-8). The last column on the right is the sum of the 8 scores. The maximum possible score with problem 7 removed was 71 points. The left most column is the student ID. From these grades each student should be able to identify their ID by matching the problem scores to the physical copy of the exam.

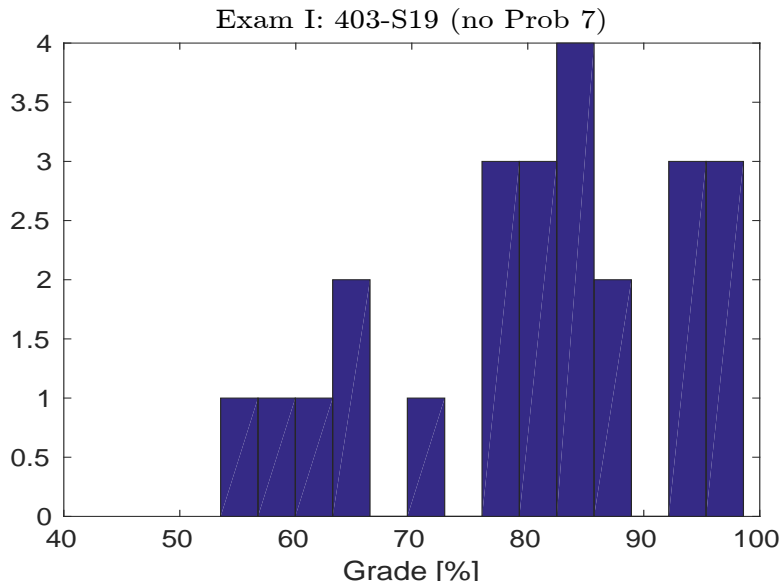


Figure 3: Histograms of the Exam I scores with Problem 7 removed. Each grade is normalized to 100%. The final grad in the course will be based on three components: HW (25%), Exam I (25%), Final Exam (50%). These weights were changed because following HW-1, I modified the homework to include the solution to each problem, thus I increased the weight of the HW to 25% to reflect this change.

Appendices

A Table of 24 scores

Three students (ID=2, 20, 26) have been removed, since they did not show up for the exam. I presume they plan to drop the course.

Table 1: Table of raw data for Exams I.

ID	1	2	3	4	5	6	7	8	Total
1	12	8	4	8	8	7	9	3	59
3	12	8	8	8	8	13	13	9	79
4	10	8	0	6	4	12	0	1	41
5	11	8	2.5	8	8	12	0	9	58.5
6	13	8	6	6	4	13	4	10	64
7	12	8	5	6	6	14	8	7	66
8	9	8	3	4	3	13	4	5	49
9	11	8	8	8	8	13	4	10	70
10	12	8	8	8	6	10	11	10	73
11	8	8	2	6	6	9	5	8	52
12	13	8	8	8	8	15	10	10	80
13	13	8	2	6	6	5	0	3	43
14	11	8	2	0	4	9	0	4	38
15	14	8	8	8	8	15	5	9	75
16	12	8	6	8	6	13	6	10	69
17	10	8	8	6	4	14	6	5	61
18	12	8	8	4	6	11	0	5	54
19	10	8	6	8	8	13	9	7	69
21	11	8	2	8	7	14	0	9	59
22	11	8	8	6	8	15	12	10	78
23	8	8	6	6	6	13	0	9	56
24	12	8	8	8	8	15	6	10	75
25	12	8	4	6	6	15	4	6	61
27	13	8	4	8	8	15	13	4	73
MAX	14	8	8	8	8	15	15	10	86