

Knowledge Probe Problems for ECE 238L for Fall 2009

Methodology:

The knowledge probe was assigned as a take home homework at the beginning of the semester, before exam #1. We summarize the results in Table 1. The basic approach was to analyze the results early and use the findings to re-visit important material within the same semester.

	Prob #1	Prob #2	Prob #3	Prob #4	Prob #5
<i>Mean</i>	87	59	80	82	97
<i>Std Dev</i>	32	36	31	27	15
<i>Median</i>	100	53	100	100	100
<i>25th Perc.</i>	100	38	57	50	100

Table 1. Knowledge Probe Statistics for ECE 238L for Fall, 2009.

Question #1. The problem asks the students to draw a timing diagram for a combinational circuit. This addresses outcome A. Since more than 75% of the students were able to answer this question perfectly, we conclude that the students were capable of producing and understanding basic timing diagrams.

Question #2. The problem asks the students to realize a circuit using different types of gates. The students had to use K-maps and transform the optimal sum of products and product of sums representations. The material addresses outcomes A and E. Given that this material is very important, it overlapped with Question #3. The low average of 59% and the low 25th percentile of 38% showed that there was not enough student exposure to NOR and NAND gates. As a result, additional time was dedicated to teaching this material in class.

Question #3. This long question goes through the basics of combinational logic design. It addresses outcomes A and E. It asks the students to use K-maps to find optimal solutions and draw the final circuit. Our expectation was to have 75% of the students to get at-least 70% of the credit. From Table #1 we can see that this requirement was not met. On the other hand, we can see that the median value is 100, implying that over 50% of the students gave a perfect answer.

A careful review of the lower grades showed that the students who performed lower did not complete or missed the last parts of the question. Given that the last parts depended on the earliest portions, this resulted in poorer performance.

Later in the semester, this type of question showed up in Exam #1 as well. Students who failed to grasp the fundamentals of this question in exam #1 were cautioned to study much harder. Several Combinational circuit design examples were posted on the internet.

Question #4. In this problem, the basic idea was to test the students understanding of the use of multiplexers for implementing digital circuits. This material addresses outcomes A and E. This problem was specialized and thus the expectations were lower. It was expected that over 75% of the students would earn over 60%. This did not happen. However, it is interesting to note that more than half the students got a perfect score on this question. The material in this problem was reviewed in class to help the students understand what they did wrong.

Question #5. The last question covered the foundations of signed arithmetic and basic logic operations. This material addresses outcome A. Over 75% of the student gave perfect answers here. This suggests that students grasped the foundations of computer arithmetic.

Lab Material for ECE 238L for Fall 2009

Successful Lab Completion

An important test of the course was to make sure that the students were able to complete the labs. Early in the semester, we placed strong emphasis on completing the first three labs. Except for one student, all other students completed the first three labs. All but one of the students completed all of the labs. Furthermore, even the student By the end of the class, among the people who stayed in the course, except for one student, everybody else completed all 9 of the labs. The one student who was an exception completed 8 out of the 9 labs. An extra credit project was assigned and completed by about 50% of the students. Here, we note that the labs were completed by Computer Science, Computer Engineering and Electrical Engineering students. Thus, the labs help address criteria A, D, E.