

ECE 360 Knowledge Probe – Spring 2011

Course Coordinator: Edl Schamiloglu

ABET Outcomes probed: A, E.

Relevant prerequisite classes: ECE 213, PHYS 161, Math 264

1. Instrument

The knowledge probe (KP) consisted of a 10 questions given to students in the class during the fourth week of the semester. The class was taught by Prof. Mani Hossein-Zadeh. Students were given 15 minutes to answer the questions.

Question 1

This question was meant to address outcome A. This question probed whether students understood the fundamental difference between an electromagnetic wave, which requires no medium in order to propagate, and an acoustic wave, which requires a medium in order to propagate. It is expected that 90% of the students would respond correctly.

Question 2

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 (a course prerequisite). Some students might not recall what is meant by a static field. It is expected that 75% of the students would respond correctly.

Question 3

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 and Math 264 (course prerequisites). The question asks about a fundamental property of vectors. It is expected that 75% of the students would respond correctly.

Question 4

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 and Math 264 (course prerequisites). The question asks about a fundamental type of vector that has unit amplitude and provides information on direction. It is expected that 75% of the students would respond correctly.

Question 5

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 and Math 264 (course prerequisites). The question asks about a fundamental relationship between a vector quantity on a surface and its value within a volume. It is expected that 50% of the students would respond correctly.

Question 6

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 and Math 264 (course prerequisites). The question pertains to the definition of the dot product. It is expected that 50% of the students would respond correctly.

Question 7

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in PHYS 161 and Math 264 (course prerequisites). The question probes whether the student can correctly calculate the gradient of a scalar field. It is expected that 50% of the students would respond correctly.

Question 8

This question was meant to address outcome E. The knowledge necessary to answer the question should have been gained in ECE 213 (a course prerequisite). The question probes the students' ability to identify, formulate, and solve engineering problems by probing whether the student understands the advantage of the Laplace transform method in solving for the transient response of a circuit. It is expected that 75% of the students would respond correctly.

Question 9

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in ECE 213 and Math 264 (course prerequisites). The question probes the students' understand of the response of an *RLC* circuit, which is described by a 2nd order linear differential equation. It is expected that 75% of the students would respond correctly.

Question 10

This question was meant to address outcome A. The knowledge necessary to answer the question should have been gained in ECE 213 (a course prerequisite). The question probes the students' ability to plot a step response in the time domain. It is expected that 75% of the students would respond correctly.

2. Results

Forty students took the knowledge probe, all students returned the test before the time out and 38 students answered all questions. Thus, the allotted time appears to be sufficient for all students to answer the questions to the extent necessary to demonstrate their knowledge.

Fig. 1(a) shows the number of students who answered the corresponding probe correctly and Fig. 1(b) shows the distribution of the total scores (out of 10).

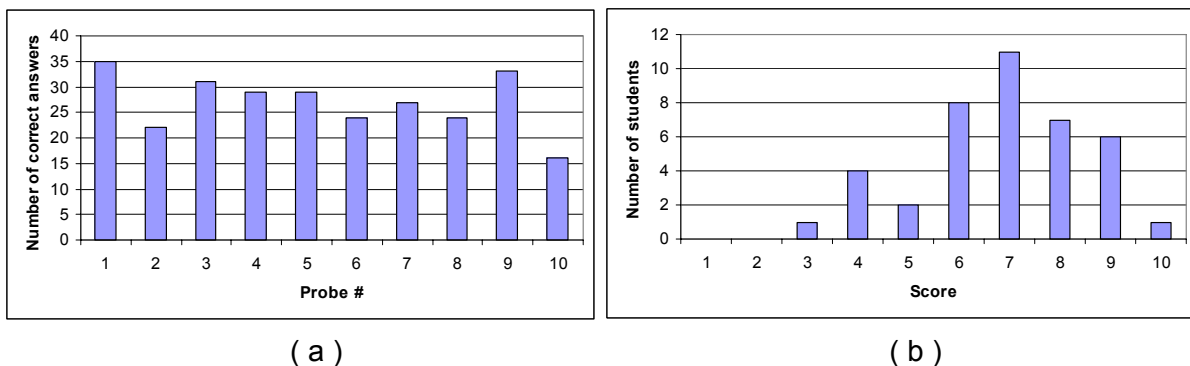


Fig. 1

Question 1

35 out of 40 students answered the question correctly. Of the 4 students who got it wrong, 3 of them answered (a) and one person answered (d).

Question 2

22 out of the 40 students answered the question correctly. Of the 18 students who got it wrong, 6 selected option (e). The remainder were almost evenly distributed among the other wrong answers.

Question 3

31 out of the 40 students answered the question correctly. Of the 9 students who got it wrong, 5 of them selected option (b).

Question 4

29 out of the 40 students answered the question correctly. Of the 11 students who got it wrong, 4 selected option (e), 3 selected option (c), 3 selected option (b), 1 selected option (d).

Question 5

29 out of the 40 students answered the question correctly. Of the 11 students who got it wrong, 5 selected option (c).

Question 6

24 out of the 35 students answered the question correctly. Of the 16 students who got it wrong, 14 selected option (b), and 2 selected option (e).

Question 7

27 out of the 40 students answered the question correctly. Of the 13 students who got it wrong, 4 selected option (e), and the remainder were almost evenly distributed among the other wrong answers.

Question 8

24 out of the 40 students answered the question correctly. Of the 16 students who did not give the correct answer, 5 did not put anything down, 7 just mentioned that it simplifies the math and the other 4 gave the wrong answer.

Question 9

33 out of the 40 students answered the question correctly. Of the 7 students who got it wrong, 3 selected option (c).

Question 10

16 out of the 40 students answered the question correctly. Of the 24 students who got it wrong, 5 did not write anything.

3. Analysis

The outcome of question 2 and 10 were lower than 60%. It seems like many student just forgot that u is the step function, which should not be interpreted as an issue in their ECE213 background (given their answers for Probe 8 and 9). However the relatively low performance on Probe 2 may be an indication of their lack of knowledge in Physics 161. Based on the outcome of question 4,5,6 and 7, the mathematics preparation of the students met the expectations. The lower performance on Probe 6 is mainly due to their confusion between Cos 30 and Cos 60 and doesn't seem to be related to their understanding of dot product. The outcomes of the other probes are above 60% and the students seemed to recall basic concepts of circuits. Overall as I have also noticed in the knowledge probe for ECE-371 (Materials and Devices), the students seem to be more comfortable with rules and equations as opposed to physical concepts.

4. Suggested Actions and Follow-up

- We can discuss the deficiencies in Phys. 161 with the Physics Department but I believe the main problem is the tendency of engineering students in memorizing rules and techniques as opposed to understanding the concepts. Based on my experience they are always searching for an algorithm for solving a problem as opposed to understanding the concepts and solving the problem using those concepts. I believe in order to address this issue in all core courses we should have more emphasize on concepts and avoid categorizing the problems and giving a systematic approach for

each category. Personally in all of my exams I dedicate about 30 points (out of 100) to concepts and usually this is the part that the students find more difficult.

- In order to find the main issues we have to design a longer, more accurate and comprehensive KP and give the students more time.