

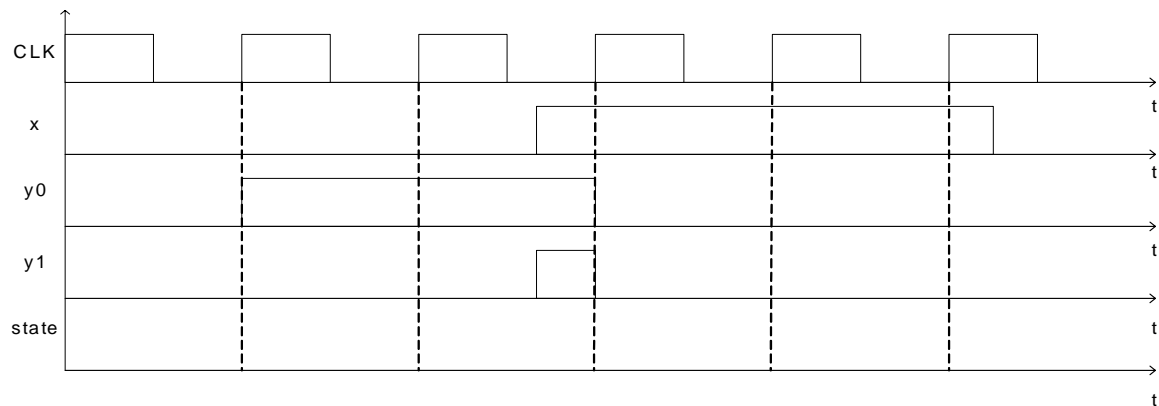
Knowledge Probe Problem for ECE 238 Lab

This document specifies the problem which will be used to evaluate the knowledge of the students enrolled in ECE 238 Lab, in some specific topics covered along the semester. It also states the objective of the problem, the methodology, and the grading policy.

Methodology: the problem will be given to the students at the beginning of a lab session. They will be asked to answer 5 questions in a very limited amount of time, namely 10 minutes.

Problem.

1- Consider the following time diagram, where x is assumed to be an input, and y_0 and y_1 outputs.



- Draw a state diagram that produces the desired outputs y_0 and y_1 .
- Draw the corresponding ASM diagram for part (a).
- Is y_0 a Moore output? Why?
- Is y_1 a Moore output? Why?
- Based on your state diagram, complete the state value on the timing diagram.

Skill tested. The problem deals with the understanding and the design of a digital sequential circuit. Specifically, the students must have a good understanding of the Finite and Algorithmic State Machine (FSM and ASM) methodology. Given the specifications for the circuit in a timing diagram format, questions (a)-(e) test the following skills:

- (a)-(b): Knowledge on the (a) state diagram and (b) ASM techniques to devise a desired FSM;
- (c), (d): Knowledge of the concepts and implementation of (c) Moore and (d) Mealy outputs, and the difference between regarding timing considerations;
- (e): Knowledge of the behavior of a synchronous state machine.

Results of the Knowledge Probe Problem for ECE 238 Lab

Question 1

71 % of the students could draw the state diagram and 40% of the students correctly answered all parts of this question. Since it is important for the students to infer the finite state machine from a timing diagram, we want to spend more time on this topic in future semesters.

Question 2

73 % of the students could give the ASM diagram flow chart. 40% of the students got all parts completely correct. Question 2 is based on question 1. Thus, roughly we expected the same percentage. However, the percentage shows that the ASM technique is harder for them, which was also noted in previous quizzes.

Questions 3 and 4

77 % and 71 % of the students answered correctly the respective questions. The T.A's emphasized many times the concept of Moore and Mealy state machines, which was understood by most of the students. The lower percentage referring to the Mealy output question also shows that more students have some difficulty with Mealy state machines (i.e., how to relate inputs and outputs from the timing diagram).

Question 5

65 % of the students answered correctly all parts of this question. Thus, most of the students fully understand the behavior of synchronous state machines. However, a big percentage (i.e., above 30 % of the total) had problems with timing analysis and how to relate states and outputs.

238 Lab Summary

Overall, 80% of the students could completely finish all the labs during the semester. Some students thought there was too much work in the lab. It appears that students did not adequately prepare for the pre-lab material. We believe that the students who read the material and the relevant lecture notes had very good grades, finished all the labs and final project on time. This suggests that we may want to consider pre-lab quizzes to test that the students properly prepare.