

CSCE 489, Spring 2009

Prerequisite Test

1 [Amdahl's law]: Suppose we make an enhancement to a computer that improves some mode of execution by a factor of 20. Enhanced mode is used 25% of the time, measured as a percentage of the execution time *when the enhancement mode is in use*.

- What is the speedup obtained from fast mode?
- What percentage of the original execution time has been converted to fast mode?

2 [Synchronization]: State the difference between a binary semaphore and a counting semaphore. Provide a concrete example where the latter is useful.

3 [Boolean algebra]: Prove that any combinational logic function can be implemented using only 2-input one-bit multiplexers and the constant functions 0 and 1.

4 [Sequential machines]: An asynchronous circuit that employs two-level AND-OR logic has the following next-state and output equations:

$$\begin{aligned}Y_1 &= y_1 y_2 + y_1 x_1 + x_1' x_2' y_1' \\Y_2 &= x_1 x_2 + x_2' y_1 y_2' + x_1' x_2' y_1' y_2' \\z &= y_1 y_2 + x_2 y_1'\end{aligned}$$

where y_1 and y_2 are the current-state variables, Y_1 and Y_2 are the next-state variables, and z is the output variable, and the primes represent complementation of variables.

Construct a logic circuit and a state (flow) table for this circuit. Show all your steps of derivation clearly.

5 [Technical Writing]: Read the article *Report Do's and Don'ts* by Craig Wills (linked to the class web page) carefully, then identify five items from his list that you would find to be most helpful in improving your report writing for this course.

6 [Profession Ethics]: Carefully read the case study "What You See is What You Don't Get" at the Online Ethics Center website:

<http://onlineethics.org/CMS/profpractice/ppcases/numericalprob/pda.aspx>

then answers the questions there on ethics and professionalism.