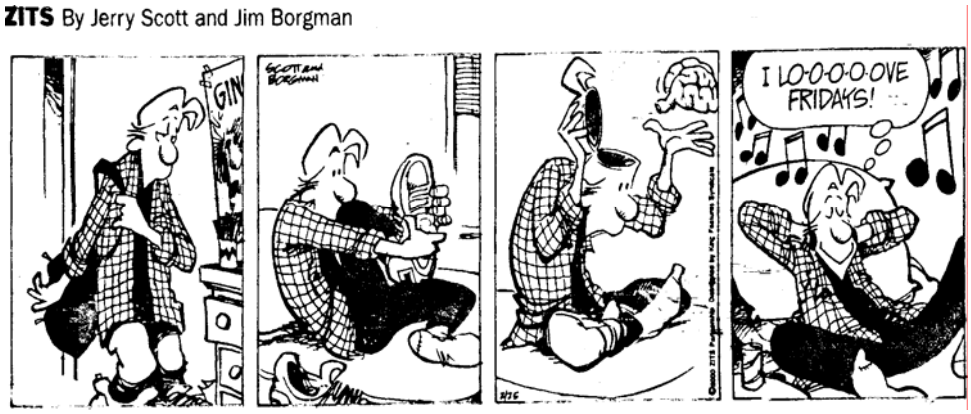
Harris

Introduction to CMOS VLSI Design (E158)

Problem Set 6



1. Do problems 4.30, 4.31, 10.14, and 11.1 from *CMOS VLSI Design*.

2. You are considering commercializing the E158 MIPS processor chip. In this exercise, you will work out some of the elements of the business plan.

a) Suppose the chip had been designed at a company rather than at HMC. Estimate the cost of the design. First estimate the annual salary of an engineer fresh out of HMC. On top of the base salary, add 30% for benefits and 50% for overhead (building lease, utilities, janitorial and secretarial staff, etc.). Add $50k/year/person to pay for CAD licenses and computer equipment. Then, based on the amount of engineering time spent on the project, estimate the total design cost.

b) You are contemplating manufacturing the chip in the MOSIS 0.6 mm process. Creating the mask set costs $50k. Suppose each 6-inch diameter wafer costs $1000 plus $1500 for processing. The yield is 90%. The ceramic PGA package costs $1.50. If the die size is 4 x 4 mm, what is the manufacturing cost per chip?

c) What is your target market for these chips? Why would the market be interested? How much would you sell the chip for?

d) How many would you have to sell at that price to break even on design and mask costs? Assume that marketing and sales consumes 30% of gross revenues. How many would you have to sell to turn everyone in the class into a (pretax) millionaire? Is your market large enough to sell this many?

3. Please indicate how many hours you spent on this problem set. This will not affect your grade, but will be helpful for calibrating the workload for the future.