

## Homework 1

UCR EE/CS120B: Introduction to Embedded Systems  
Fall Quarter 2004, Lecturer Brian Grattan

Due Tuesday, Oct. 5 at the BEGINNING of lecture.

Name: \_\_\_\_\_ Solutions \_\_\_\_\_

UCR ID#: \_\_\_\_\_

For this assignment, you will hand in a hard-copy on Tuesday, October 5. But, since we are experimenting with a new system, you will get one point extra credit if you also have a .pdf version of your answers to be either e-mailed or turned in using WWW turn-in on that day. Regardless of whether or not you have the .pdf version, you MUST turn in a hard-copy on Tuesday.

1. (1 points) If you are redesigning an integrated circuit that, when fabricated six years ago, took up  $12\text{mm}^2$ , roughly how much space would you expect it to take today?

Transistor capacity doubles every 18 months, due mostly to the size reducing by a factor of 2 every 18 months. There are 6/1.5 (four) 18 month periods, so the total area would be  $12/2^4$  ( $0.75\text{mm}^2$ ).

2. (1 points) Find the MicroBlaze processor on the Xilinx web-site. Is this a single purpose, application specific, or general-purpose processor? Give reasons for your answer.

General Purpose Processor. (Any reasonably well written reasons accepted)

3. (4 points) Using the information on page six of the textbook under "The Time-to-Market Design Metric." Explain why the statement: "If we let the schedule slip by only 5% of the lifetime of the product, we'll only loose 5% of the total revenue." is false.

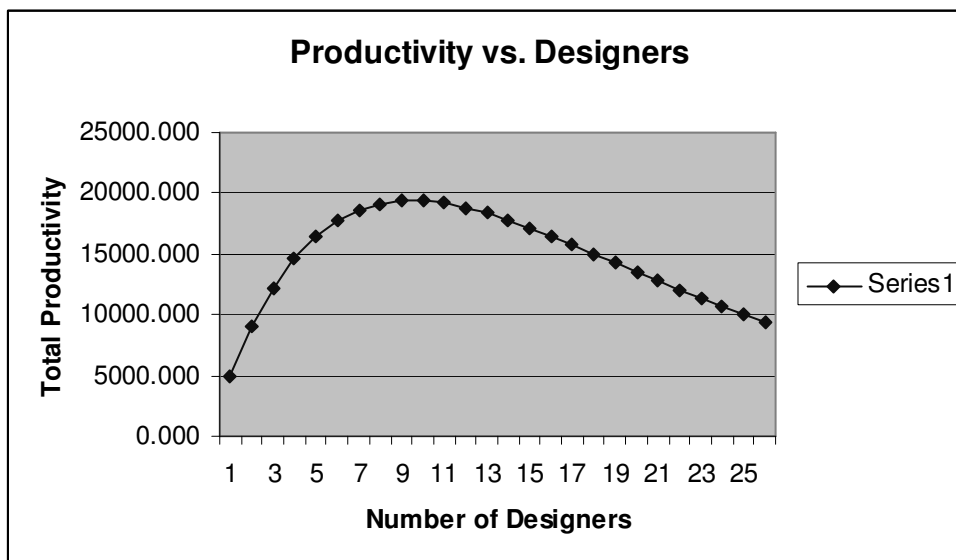
The loss of revenue due to schedule slipping is not linear. From the time-to-market vs. revenue graph one can see that any loss in time affects the base and the height of the first triangle, as well as the height of the second triangle. (Students may also illustrate with an example)

4. (2 points) Which of the processor technologies listed in section 1.3 of the textbook will be the most efficient (as far as the use of silicon in the IC is concerned) for a given functionality.

Single Purpose Processor

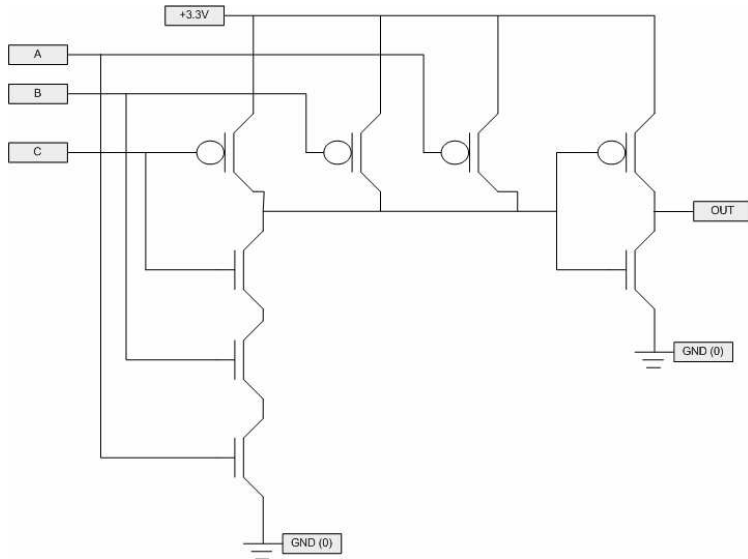
5. (2 points) What is the difference between compilers and synthesizers?  
Compilers take a high level language and translate it into assembly code for a particular processor. Synthesizers take a high level language and convert it into gates or some other digital implementation.

6. (4 points) Assume you are the manager for a big design project. You know that each designer on your team is capable of 5000 transistors/month if he or she is working alone. You also know that each time you add a person to your team, the productivity of each person goes down 10%. Use Excel, Matlab or some other program to graph what the total productivity (of all designers combined) will be as you add members to your team. Also, determine the number of team members that will have the max productivity. To check your graph, it should be "number of designers" on the X-axis, and "transistors/month" on the Y-axis.



The maximum productivity is achieved with either 9 or 10 designers.

7. (4 points) Make a truth table for the following circuit and draw the equivalent symbol for its functionalist (meaning, draw an OR gate if it is an OR function). A few notes: 3.3V is the positive voltage and equivalent to '1' in the book, if lines cross over each other and there is not a circle at the intersection they are not connected.



| A | B | C | OUT |
|---|---|---|-----|
| 0 | 0 | 0 | 0   |
| 0 | 0 | 1 | 0   |
| 0 | 1 | 0 | 0   |
| 0 | 1 | 1 | 0   |
| 1 | 0 | 0 | 0   |
| 1 | 0 | 1 | 0   |
| 1 | 1 | 0 | 0   |
| 1 | 1 | 1 | 1   |

