

## Cpr E 381 Homework 1

1. Compare the timing of the polynomial computation structures from the lecture notes (slides 6, 7, 10, 11) considering the time to compute a multiplication as  $T_m$  and the time to compute an addition as  $T_a$ . Compare the area required for these structures using  $A_m$  and  $A_a$ . Make some general statements about tradeoffs with the assumption that multiplication requires substantially more area and time to compute than addition.
2. Write a pseudo-assembly language program for the polynomial expressed in factors on the lecture notes slide 15.
3. Use a spreadsheet to generate a Babbage difference engine computation as in the lecture notes for the polynomial  $(2x^4 + x^3 - 4x^2 + x - 3)$  for the values of  $x$  from 0 to 12.
4. Draw the simplest structure (minimum inputs and minimum modules) using only addition modules to produce the first seven numbers in the Fibonacci series beginning with the number 0. Label all inputs and outputs.
5. Convert the value 435 in base 10 to a value in base 7. And also to a value in base 9.
6. Write the binary values of the ASCII representation for the string, "Cpr E 381" (ignore quotes).
7. How many bits are required to represent the Greek alphabet, both upper and lower case?
8. Convert the following numbers (base 10) to binary in sign magnitude, one's complement, and two's complement. Use the same number of bits for all values selecting the minimum number of bits from the value with the longest representation.
  - a. 17
  - b. -1
  - c. -32
  - d. -5
9. How many vacuum tubes did the ENIAC contain? How many transistors are in the processor on your personal computer (state the processor type)?
10. Write the Verilog description of the modules for an XOR gate and an XNOR gate?