

## INEL 4206 – Microprocessors

### Exam III – Topics and Practice Problems

#### **Topics**

- ?? Review all previous material up to Exam I
- ?? Procedures
  - Parameter Passing
  - Stack frames
  - Recursive procedures (Problem Set 3)
- ?? Data Representation
  - Signed and unsigned integers
  - Floating point numbers
    - ~~///~~ Single precision
    - ~~///~~ Double precision
    - ~~///~~ Converting between decimal scientific notation and IEEE 574
  - Arrays
    - ~~///~~ One dimensional
    - ~~///~~ Two dimensional
    - ~~///~~ Multi-word objects
- ?? Easy I simulator implementation

**NOTE: The material on the Intel Pentium processor will be tested on the final exam.**

#### **Practice Problems**

1. Write a recursive procedure to compute and return the greatest common divisor (GCD) of 2 integer arguments. First write the procedure in a HLL and then compile the HLL code to MIPS assembly. The GCD can be defined recurrently as:
  - a.  $\text{GCD}(a, b) = b$  if  $b$  divides  $a$
  - b.  $\text{GCD}(a, b) = \text{GCD}(b, r)$  otherwise, where  $r = a \text{ MOD } b$

2. Write a procedure called `precision()` with no arguments. The procedure must return the smallest floating point number that can be added to 1 such that the result of the sum is different from 1.
3. Write a procedure `sin(x)` that takes one float argument representing an angle in radians. The procedure should return the approximated floating point value of `sin(x)` by computing the sum of a Taylor series. First write the procedure in a HLL and then write in MIPS assembly language.
4. Write procedures that take a one dimensional array of integers `a` and its length and perform the following operations:
  - a. Multiply the array by a scalar
  - b. Compute the sum of the elements of the array
  - c. Sort the array increasingly
5. Repeat problem 3 this time using arrays of double precision floating point numbers.
6. Write a procedure `mmult(a,b,c,n)` that takes as arguments three square matrices `a`, `b` and `c` with common length `n`. The procedure should compute the matrix product of `a` and `b` and store the result on matrix `c`. First write a HLL version of `mmult` and then hand-compile it to MIPS assembly language.
7. All the problems on Chapters 3 and 4 of Patterson and Hennessy Computer Organization and Design.

### **REMINDER**

**We will have exam 3 next Monday April 22 from 6-8 PM in S-113.**