

## EC340 COMPUTER ORGANISATION AND ARCHITECTURE

### Assignment 2

Date of submission – February 27, 2022

The assignment can be done as a group of 2 or 3 students. Only one submission is required per group.

*Assembly language programming using the MIPS instruction set. As you are doing assembly language programming in Microprocessor lab, this exercise is intended only to familiarise with the instruction set of MIPS processor through simple exercises.*

For this exercise, you can download the SPIM assembler (or its latest version QtSim) from

<http://pages.cs.wisc.edu/~larus/spim.html>

Tutorial for SPIM is available at

<http://courses.cs.washington.edu/courses/cse410/08sp/notes/spim/SpimTutorial.pdf>

and tutorial for QtSim at

<https://open.umn.edu/opentextbooks/textbooks/734>

You can use any text editor to edit the code. Example codes add.s and arraysum.s are provided. Use pseudo instructions only if absolutely necessary.

- a) Assume that you have an array of 10 elements with base address in \$s0. Write an assembly program to find the minimum value from the array and swap it with the last element in the array.
- b) Assume that you have an array of 10 elements with base address in \$s0. Assume that the base address of a second array is in \$t0. Write an assembly program to copy the elements from the first array to the second.
- c) Write an assembly program to convert red-green-blue (RGB) values for a set of pixels into a single gray value per pixel. You are given an array called pixels, each element of which is a 32-bit word representing a color value. The lowest 8 bits of each color value denote an unsigned integer representing the BLUE value, the next 8 bits are the GREEN value, the next 8 bits are the RED value, and the most significant 8 bits are all zeroes.  $\text{gray value} = (\text{red} + \text{green} + \text{blue}) / 3$  (integer divide and truncate). Use a separate procedure rgb2gray and print each RGB value and the corresponding gray value on the console.