Assignment – 1

Due: Mon. 21 August at 11:00 AM

Submit a printed copy of your answers, with a cover sheet which indicates your name, ID and the course number.

NOTE: Your assembly code must have comments if necessary.
Do not use pseudo instructions (except *la* if necessary.)

1. Write the **minimum** sequence of MIPS instructions for each of the following arithmetic operations.

   (a) integer division of the contents of register $12 by 128 and put the result in register $14.

   (b) double-precision floating-point multiplication of the contents of register pair $f12-$f13 by 16 and put the result in register pair $f10-$f11.

2. Write the MIPS sequence of instructions which copies the elements of array A (which is stored in a little-endian architecture) to array B (which is stored in a big-endian architecture). Each element is a 32-bit integer value. Arrays A and B have 1000 elements and the base address of arrays A and B are in registers $11 and $12 respectively.

3. (a) Write a function, which takes an array of characters (*null terminated string*) and finds how many "in" are in the string. The input argument of the function is the base address of the array. The function returns a number, which indicates how many "in" are in the string. The maximum number of characters in the array (or string) is 254.

   (b) Write the main program, which calls this function.
   Test your code on SPIM, using a simple array of characters, which has some "in". (For example, "Shervin was in the garden in the morning." can be used.).

4. (a) Write a function to calculate the following arithmetic operation and return the result.

   $$z = 1 + (3x)^4 + y/2^n$$

   (x, y and n are arguments of the function where x is an integer in the range $0 < x < 10$, y is a positive 32-bit integer and n is an integer in the range $0 < n < 7$). z is also an integer.

   The function returns 0, if the input arguments are not in the specified range, otherwise the result is returned.

(b) Write the code for the main function which calls the above function with arguments x = 4, n = 5 and y = 4096. *Test your code using SPIM.*
Note: Part (b) of this question is optional.

5. Write a function, which performs the following operation.

$$Y[i][j] = 1 - (X[i][j] / 8)$$

X and Y are two-dimensional arrays (or matrices) of ***double*** (double-precision floating point) numbers.
The base address of matrices X and Y, the indices i and j and the number of rows of the matrix (which is the same for both X and Y) are input arguments of the function.

(Assume that the processor is ***little-endian***).