CSE 3038 – Computer Organization **Spring 2022**
Prof. Haluk Topcuoglu

HW 2 – Due 06 / 04 / 2022

(**Note**: *The homework is given in order to prepare yourself for the quizzes and the exams. Therefore, you will not submit the homework at the due date. The solutions will be covered in a problem session right after the due date.*)

Questions

1. For the following C statement, what is the corresponding MIPS assembly code? Assume that the variables f, g, h, i, and j are assigned to registers $s2, $s3, $s4, $s5, and $s6, respectively. Assume that the base address of the arrays A and B are in registers $s0 and $s1, respectively.

```
B[i+3] = A[i+4*j];
```

2. Show how the value 0xcabd1f2e would be arranged in memory of a little-endian and a big-endian machine. Assume the data is stored starting at address 0.

3. Translate the following C code to MIPS. Assume that the variables f, g, h, i, and j are assigned to registers $s0, $s1, $s2, $s3, and $s4, respectively. Assume that the base address of the arrays A and B are in registers $s6 and $s7, respectively. Assume that the elements of the arrays A and B are 4-byte words:

```
B[i+j+1] = A[i+j-2] + A[i-j+1];
```

4. Provide the type, assembly language instruction, and binary representation of instruction described by the following MIPS fields:
op=0, rs=5, rt=8, rd=20, shamt=0, funct=36.

5. For the following C statement, write a minimal sequence of MIPS assembly instructions that does the identical operation. Assume $t1 = A, $t2 = B, and $s1 is the base address of C.

```
A = C[0] << 8;
```

6. Translate the following C code to MIPS assembly code. Use a minimum number of instructions. Assume that the values of a, b, i, and j are in registers $s0, $s1, $t0, and $t1, respectively. Also, assume that register $s2 holds the base address of the array D.

```
for(j=0; j<a; j++)
    for(i=0; i<b; i++)
        D[2*i] = i + j - 5;
```

7. How many MIPS instructions does it take to implement the C code given in the previous question (Question 6)? If the variables a and b are initialized to 10 and 1 and all elements of D are initially 0, what is the total number of MIPS instructions that is executed to complete the loop?