COSE222 Computer Architecture
Assignment #1

No late turn-in accepted

1. Install the RISC-V (RV32I) cross-compiler posted on the class web (RISC-V Cross-Compiler with Eclipse).

2. Using the C program in Code 1, go through the compilation steps we studied in the class. After each step, print out the outcome.

   - Native compilation to generate x86 machine code: Open a shell using "Cygwin Terminal (for example)" in Cygwin, and print out the outcome after each of the following steps
     - Preprocessing
     - Compilation
     - Assembler (assembler output is binary (not human-readable), so use `objdump` for disassembling the object code and print out the `objdump` outcome)
     - Linker: Please do not do this step. Actually it will fail if you try to do this because there is no `main` function in the `compare` C program (Code 1)

   - Cross-compilation to generate RV32I machine code: Use the Eclipse environment you set up and print out the outcome after each of the following steps
     - Preprocessing (use `riscv32-unknown-elf-cpp` for preprocessing)
     - Compilation (use `riscv32-unknown-elf-gcc` for compilation)
     - Assembler (use `riscv32-unknown-elf-as` for assembling, then use `riscv32-unknown-elf-objdump` for disassembling the object code)
     - Linker (use `riscv32-unknown_elf-ld` for linking, then use `riscv32-unknown-elf-objdump` for disassembling the binary)

     (For the RISC-V cross-compilation, please refer to an example (**lab0_c_asm_mix**) in the cross-compilation environment you set up. 1. `Makefile` contains all the information for compilation. 2. Replace `j SevenSeg` in `lab0.S` with `j compare`. It is because the function name in Table 1 is `compare`)

Code 1. 'compare' C program

```
#define min(x,y) ((x) < (y) ? (x) : (y));

int compare(int b, int c)
{
      int a;
      a = min(b, c);
      return a;
}
```

What and How to submit:
Submit (Upload) pdf to Blackboard. The pdf should have the following contents;

1. Explanation of the role of `Makefile` in Eclipse project
2. Outputs of each compilation step in the native compilation
3. Outputs of each compilation step in the RISC-V cross-compilation

Note: This is an individual assignment. You are welcome to discuss, but DO NOT COPY solutions. If you are found to copy solutions from others or slightly modify the solutions from others, both of you will be given 0 credits.