Sử dụng Raspberry Pi PICO để tạo ra một vi điều khiển 8-bit đơn giản.

Yêu cầu thông số kĩ thuật cơ bản:

1. Internal register configuration

+ Program Counter (start from 0)

+ general-purpose register r0 to r3

+ status register (Zero, OF)

2. 内蔵プログラムROM: 128 bytes (address from 0 to 7F)

3. 内蔵プログラムRAM: 128 bytes (address from 80 to FF)

4. Instruction setting

- Data transfer:

a) Transfer instruction between memory and general-purpose register r0

b) Transfer instruction between general-purpose registers (r0 to r3)

c) Immediate value setting instruction

- Arithmetic instruction: Addition and substraction instruction (between general-purpose registers)

- Bit shift instruction: General-purpose register right/left 4-bits shift

- Comparison instruction (between general-purpose registers)

- External input/output instruction

- Branch instruction  
a) Unconditional branch (branch destination specified by r0 to r3)  
b) Conditional branch (branch destination specified by r0 to r3)

Points and remark to consider when creating a simple 8-bit CPU:

The instruction execution of the CPU should be divided into the following three major phases, and each should be implemented:

* **Fetch**: The CPU retrieves an instruction from the program ROM and brings it into the CPU.
* **Decode**: The CPU analyzes the fetched instruction to determine what kind of instruction it is.
* **Execute**: Based on the analysis result, the CPU executes the actual operation.

By repeatedly executing the above steps, the system should function as a CPU. Where possible, implement functions, and ensure that each function has fewer than 100 lines. Each function should include comments that clearly describe its role and what it does.