FTE Question Set

Tasks

Please use a custom build system like *avr-gcc* + *Makefile* that compiles the project for an Arduino board of your choice. The project should be written in pure C at the bare-metal level without using the Arduino library.

The task can be performed on the hardware or simulators like Wowki, TinkerCAD, etc. The tasks will be evaluated based on performance, modularity, conciseness, and clarity.

Your final submission should be a git repo with each task solution having its own branch.

Task 1

Blink an LED on an Arduino board.

Task 2

Write an 8-bit Fibonacci sequence counter. Display the output using an LED array.

Note

8-bit implies that the counter value should be an 8-bit number, and the counter should loop back to 0 on exceeding the range.

Bonus

Explain how, for 32-bit numbers, you plan to scale this approach.

Task 3

Extending upon the previous example, instead of using LEDs, display the counter output using an array of 7-segment displays.

Bonus

Can you reduce the number of I/Os used on the Arduino?

Task 4

Build a system comprising two Arduino boards, A and B, with their roles defined as follows:

- A and B communicate over SPI.
- A sends a pair of numbers (x, y) to B where x is an integer, and y is a number denoting an arithmetic operation as follows:

y	Operation
0	f(x) = x+1
1	f(x) = x-1
2	f(x) = x*2
3	f(x) = floor(x/3)

B responds with f(x).

Note

Implement an ACK/NACK mechanism for the SPI transactions to handle invalid commands and other edge cases.