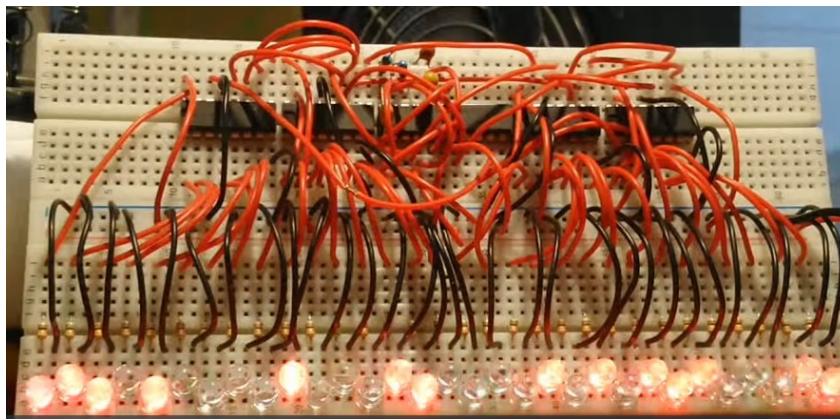


## Project : Fibonacci LFSR

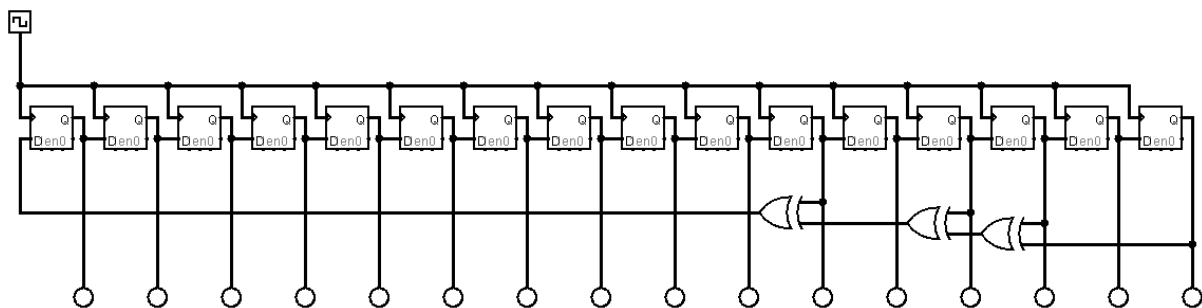
The project for this year is about building a random number generator, it is an easy hardware circuit to construct, yet allowing the creation of a powerful pseudo-random generation device. In other way, we are trying to recreate what the function Random generate in many programming languages.



Fibonacci LFSR on breadboard

The first think to put in mind is to understand that generation random numbers in computer is not an easy task like in real world. Actually, it is very hard in hardware to recreate a real random generator. Then, we are forced to create what we call pseudo-random generators. Pseudo-random generators are critical for cryptography.

We can see in the diagram below the schematics of a hardware circuit of what we call Fibonacci Linear-Feedback Shift Register (LFSR). This circuit is a well known random generator. Even though it is called Fibonacci, it has no pretension to generate the Fibonacci sequence.



Fibonacci LFSR diagram

If we observe this circuit we can easily note that the 16 bits shifter is the main component of the circuit. This kind of circuit is called Linear-Feedback Shifter, because we have a return in

a loop of some shifter bits to the beginning, going through some sort of function. In our case that was multiple Xor gates.

For this project you need to implement this circuit using gates and flipflops from the family of chips 7400-series, and some LEDs for display. Implemented on a breadboard and using the circuit 555 like a clock. To work properly, the shifter should be initialized with a value different from 0 in the start-up.

## Clauses and conditions

- The project is intended to be achieved physically using breadboards, the course videos contain a brief introduction to breadboards.
- To be accepted, the circuit should follow the specifications detailed above.
- This project should be done individually, in a monomial number of students.
- The project is limited for a total number of ten students accepted, which means, only the first ten valid submissions will be accepted.
- For submission, a student should send a clear small video of the proper working of the circuit (not images).
- The submission email address is [kara.abdelaziz@el-kalam.com](mailto:kara.abdelaziz@el-kalam.com).
- The deadline for submission is dated to the 20/05/2023 at 00:00.
- For the accepted submissions, an appointment will be programmed with the student to inspect the physical working circuit.
- The use of intelligent boards like Arduino or Microcontrollers for this project is prohibited, only simple digital chips are allowed.
- One tip to implement a proper working circuit, is to add a pulldown resistor for each push button, preventing floating values.
- The student accomplishing this project will be rewarded with 5 bonus points in TD mark.

وفقكم الله