



Istanbul Technical University

CEN 242E – Logical Circuits Lab

LAB 5: Memories

About LAB:

Memories

Stages and scores of LAB :

1- ROM-Based LED Pattern Generator

A design will be implemented to control the movement of 8 LEDs using a ROM-based system. The LED patterns will follow the sequence shown below:

```
* _ _ _ _ _ *
- * _ _ _ _ * -
- - * _ _ * - -
- - - * * - - -
- - * * * * - -
- * * * * * -
- - * * * * - -
- - - * * - - -
- - * _ _ * - -
- * _ _ _ _ * -
* _ _ _ _ _ *
```

Requirements:

- Design an **8-bit ROM with 11 address locations**.
- Fill the ROM contents according to the LED patterns given above.
- Each address corresponds to one LED pattern (**1 = LED ON, 0 = LED OFF**).
- The system should read data sequentially from ROM at **1-second intervals**.
- Observe and verify that the LEDs display the expected movement pattern.

2- RAM-Based LED Pattern Controller

In this part, the previously designed ROM will be converted into a **RAM-based system** that allows dynamic updating of LED patterns.

Additional Components:

- **12 switches**
- **3 push buttons**
- **3 registers:**
 - addressInput (formerly *adresGiris*)
 - dataInput (formerly *dataGiris*)
 - writeEnable (formerly *yazmaAktif*)

Functionality:

- When **Button 1** is pressed → the value of the switches is loaded into addressInput.
- When **Button 2** is pressed → the value of the switches is loaded into dataInput.
- When **Button 3** is pressed → writeEnable is set to 1 (activates write operation).

Using these registers, the contents of the RAM (LED patterns) can be modified during operation.

Task:

- Initially, the 5th pattern is:

```
_ * * * * * _
```

- Modify this pattern to:

```
_ * * _ _ * * _
```

- Perform this update **while the FPGA is running**, using the switches and buttons.
- Observe and verify that the LED pattern changes accordingly in real time.