

Term Project Proposal**EEE102 2022-2023 Fall****Emre Uncu****22003884****Section-02****Abstract**

This project aims to convert four main number systems (Binary, Octal, Decimal, and Hexadecimal) to each other. Processors process and store data according to the principles of a different number system than the number systems we use in daily life. Therefore, it is necessary to know the Binary number system to understand the structure of processors and software. In addition, it will be helpful to learn the Octal Number System and Hexadecimal Number System, which are close to the binary number system.

Decimal	Binary	Octal	Hexadecimal
0	0000	000	0000
1	0001	001	0001
2	0010	002	0002
3	0011	003	0003
4	0100	004	0004
5	0101	005	0005
6	0110	006	0006
7	0111	007	0007
8	1000	010	0008
9	1001	011	0009
10	1010	012	A
11	1011	013	B
12	1100	014	C
13	1101	015	D
14	1110	016	E
15	1111	017	F

There are some formulas and procedures to make the conversion between the Decimal number system we use daily and these systems. With this project, this procedure is done entirely with BASYS3 for ease of operation and time-saving.

Project Design Specification Plan

First of all, the desired conversion mode will be determined by the buttons on the FPGA. The conversion mode can be seen on the 4-digit 7-segment display; for example, for Hexadecimal to Octal display shows "H – O." Afterward, the desired number can be determined with a 4x4 membrane keypad or switches according to the appropriate mode. The result of the conversion will be displayed on the 4-digit 7-segment display or with the LEDs on the board.

Function of BASYS3

The implementation of this project will be done by using BASYS3. The 4-digit 7-segment display and 16 LEDs on the board will be used to display numbers on different bases. Sixteen switches on the board will be used to generate the binary code by turning the sixteen LEDs on and off. Also, five buttons on the board will be used to change the mode of the base converter.

Progress Demo

4x4 membrane keypad will be integrated with BASYS3, and it will be verified that it works properly. This tool will verify that the desired number is displayed on the 4-digit 7-segment display. With each switch, the LED on it will be turned on and off. Lastly, it will be checked that the desired mode can be selected with the buttons.

Final Demo

By making the necessary coding with VHDL, it will be checked that the conversions are done correctly. As a result of entering the desired number as input, displaying the appropriate number as output will work properly.

Components

- ❖ BASYS3
- ❖ 4x4 Membrane Keypad
- ❖ Breadboard
- ❖ Jumper Cables