

Idea 1: Digital Calculator

Description: Design a calculator that can perform addition and subtraction operations of two 5-bit numbers.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 2: Password Encryption System

Description: Design an 8-bit password encryption system. The system should allow to set a password, and for verification, the user must enter the 2s complement of the password. The entered value should then be compared with the stored password.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR, Parallel Adders.

Sample Input-Output:

i. Input - 1: first user will set this password - 10101100
ii. Input - 2: then user will enter the 2s complement of the entered password - 01010100
Output: Led should turn on.

i. Input - 1: first user will set this password - 10101100
ii. Input - 2: then user will enter the 2s complement of the entered password - 01010111
Output: Led should not turn on.

Idea 3: **Seven-Segment Display for Text Representation - 1**

Description: Design a Seven-Segment Display system capable of representing all the necessary characters to display the text 'mArAUdEr's-mAP'.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 4: **Multiplier**

Description: Design a multiplier that can perform multiplication between two 4-bit numbers.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR, Parallel Adders.

Idea 5: **Optimized Parity Bit Generator**

Description: Given a 10-bit data, design a checksum parity bit generator to ensure data integrity during transmission.

First, determine whether the data is even or odd:

- If the data is even, add the first 5 bits to the last 5 bits.
- If the data is odd, subtract the last 5 bits from the first 5 bits.

Afterward, compute the even parity of the result to generate the final checksum.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 6: Comparator

Description: Design a circuit that compares two 4-bit numbers and determines the larger number between them. The circuit should display that larger number as the output.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR, Mux(s)

Idea 7: Voting System

Description: Design a voting system for a 7-person panel to determine the winner between two competitors. The system should take individual votes as input and output the winner based on the majority vote. Show the final output using a seven segment display.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 8: Shifter

Description: Build a system that takes a 12-bit number from the user and shifts the number by 1 bit left or right based on user input. The output should show the shifted number (12 bit).

0 => left shift

1 => right shift

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 9: Seven-Segment Display for Text Representation - 2

Description: Design a Seven-Segment Display system capable of representing all the necessary characters to display the text 'JUSTICELEAGUE'.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Idea 10: Adder

Description: Build a circuit that can add four individual 3 bit numbers and show the final output.

ICs/Gates allowed to use: AND, OR, NOT, NAND, NOR, XOR, X-NOR.

Sample Input-Output:

Input: 110, 111, 110, 100

Output: 10111