

# FPGA-THON Problem Statements

## Hardware Circuit Design:-

1. Hardware Design (Schematics Design only using ISE 14.7 and below) of 4 bit Signed calculator (+, -, % \*) and implementation on SSD
2. Hardware Design (Schematics Design only using ISE 14.7 and below) of Algebraic Equations (example-  $a^2 + b^2$ ) and implementation on SSD
3. Hardware Design (Schematics Design only using ISE 14.7 and below) of VAP-D(volume, area, perimeter, diagonals) and implementation on SSD
4. Hardware Design (Schematics Design only using ISE 14.7 and below) of ALU ( which can perform 32 different operations) and implementation on SSD
5. Hardware Design (Schematics Design only using ISE 14.7 and below) of Digital Clock (Give input 100 mhz) (DAYS : HRS : MIN : SEC) and Stop Watch and implementation on SSD
6. Hardware Design (Schematics Design only using ISE 14.7 and below) of 4 way Traffic Light Control System with option of changing the signal time with respect to heavy traffic and implementation on SSD

Tool: ISE 14.7

Board: Nexys

## DSP FPGA:-

1. Active white noise cancellation system of audio using fpga
2. Automatic aquarium echo system controller including temperature, humidity and pump control
3. White Gaussian noise generator with mean and variance control in real time (baseband analog output for mixer )

Tool: Vivado

Board: Nexys

## RTL + Embedded FPGA

1. Generate PWM Signal using inbuilt clock of Pynq Z2.
2. Measure room temperature using device XADC on Pynq Z2.

3. **Remote Data Logging and Monitoring:** Create a remote data logging and monitoring system that collects data from sensors connected via USB and transmits this data over Ethernet to a remote server for real-time monitoring and analysis.
4. **Countdown Timer:** Create a countdown timer for events that displays the remaining time until a specific date and time, using the RTC clock to maintain accuracy.
5. **Ethernet-Controlled RGB Lighting:** Develop an RGB lighting system using LEDs that can be controlled remotely via Ethernet. Users should be able to customize and change the lighting colors and patterns using a web interface.
6. **Secure Door Access Control:** Develop a secure door access control system using buttons for PIN entry and Ethernet for remote access management. User can input a PIN through the buttons to unlock a door remotely
7. Build a solution to extract the data from an Ethernet packet and send the extracted data to a Computer via UART.
8. Use the XADC on the Pynq board to capture a signal from signal generator and compute its FFT with variable resolution on python.
9. Design & Implementation of Digital Conversion (input from key board , conversion like for example grey to binary etc. any 5) and display on VGA.
10. Design & Implementation of AES & DES (Input from Keyboard) and display the data on VGA.

Tool: Vivado

Board: PYNQ