PANIMALAR ENGINEERING COLLEGE

An Autonomous Institution

[JAISAKTHI EDUCATIONAL TRUST]

Approved by AICTE | Affiliated to Anna University | Recognized by UGC

All Eligible UG Programs are Accredited by NBA

Bangalore Trunk Road,Varadharajapuram, Poonamallee, Chennai- 600 123

TECHDIVATHON

Empower, Innovate, Elevate: Code the Future Together

Domain: VLSI

Problem Statements:

S. No	Title	Problem Statement	Description
1	Design of Energy-Efficient Multipliers for IoT Applications	Develop low-power multipliers optimized for IoT devices to enhance battery life while maintaining computation accuracy.	These multipliers will process arithmetic operations critical for IoT sensors with minimal power consumption, enabling long-term deployment in energy-constrained environments.
2	High-Speed Memory Interface for AI Workloads	Create a VLSI architecture for high-speed DRAM controllers to support the bandwidth requirements of modern AI applications.	Focuses on bridging the gap between memory and processors by providing low-latency data transfers for smooth execution of real-time AI models in high-performance systems.
3	3D ICs for Compact Chip Design	Design a 3D Integrated Circuit (IC) architecture that minimizes interconnect delays and improves performance.	By stacking circuits vertically, 3D ICs reduce physical footprint and signal travel distances, enhancing speed, reducing power consumption, and enabling compact yet powerful devices.
4	Low-Power ASICs for Mobile Devices	Develop application-specific integrated circuits (ASICs) optimized for ultra-low power consumption.	These ASICs will handle specialized functions like image processing or signal decoding with minimal energy usage, ensuring efficiency in high-performance mobile devices.
5	Fault-Tolerant Logic Circuits for Space Applications	Design VLSI circuits with fault-tolerant capabilities to withstand high-radiation environments in space missions.	Incorporates redundancy and error-correction mechanisms to maintain functionality, ensuring reliability in harsh space environments for critical systems.
6	High-Performance Analog-to-Digital Converters (ADCs)	Create ADCs for high-speed data acquisition systems used in medical imaging and communication systems.	Ensures high precision and rapid processing by seamlessly converting analog signals to digital formats for applications like ultrasound and high-speed networks.
7	RF Circuits for 5G Communication	Design energy-efficient RF front-end modules to support	Amplify, filter, and process signals in the millimeter-wave range, essential for

		high-frequency bands in 5G networks.	high-speed, low-latency wireless communication in 5G networks.
8	Non-Volatile Memory Design for Edge Computing	Develop low-power non-volatile memory (NVM) architectures for edge devices handling real-time data processing.	Ensures reliable data storage and quick retrieval with minimal power consumption, enabling real-time analytics in IoT and edge devices.
9	Mixed-Signal ICs for Biomedical Applications	Create integrated circuits that combine analog and digital components for medical implants and wearable devices.	Facilitates monitoring and processing of biological signals with high accuracy, supporting advanced technologies like pacemakers and health trackers.
10	Chip Design for Quantum Cryptography	Build VLSI designs supporting secure quantum key distribution for cryptographic systems.	Leverages quantum cryptographic principles to ensure secure communication and resilience against computational attacks.
11	CAD Tool for Power Optimization in VLSI Circuits	Develop software tools that automate power analysis and optimization in large-scale IC designs.	Provides simulation, analysis, and optimization features to minimize power consumption and ensure efficient chip performance.
12	AI-Powered Logic Synthesis Tools	Create AI-driven tools to simplify logic synthesis and optimize gate-level designs for improved performance.	Accelerates synthesis processes, optimizes logic gate configurations, and reduces resource utilization in complex VLSI projects through AI.
13	Thermal Analysis Software for High-Density Chips	Develop software solutions for simulating and analyzing thermal behavior in densely packed VLSI chips.	Predicts heat dissipation patterns, enabling the design of thermally optimized chips to prevent overheating in high-performance systems.
14	Fault Simulation for Digital Circuits	Design fault simulation tools to predict and mitigate errors in VLSI circuits under varying operational conditions.	Simulates faults in circuit designs, allowing engineers to identify vulnerabilities and implement corrective measures before fabrication.
15	Timing Analysis for High-Speed ICs	Build software for accurate timing analysis of VLSI circuits to ensure high-speed performance.	Optimizes signal timings to prevent delays and ensures smooth operation in high-frequency integrated circuits.
16	Automated Placement and Routing Algorithms	Develop advanced algorithms for placement and routing that optimize area and minimize interconnect delays.	Automates the arrangement of circuit components and connections, improving chip performance and reducing design time.
17	VLSI Design Verification Using Formal Methods	Create tools to verify digital designs using formal verification techniques to ensure correctness.	Validates the logical correctness of VLSI designs, eliminating errors and enhancing reliability through formal methods.
18	Low-Power Design Automation Framework	Develop a software framework for automating low-power VLSI design processes, including clock and power gating.	Streamlines the implementation of power-saving techniques, helping designers achieve energy-efficient chip designs.
19	Open-Source FPGA Programming Tools	Build user-friendly tools for programming and testing open-source FPGA platforms.	Provides intuitive interfaces and robust features for designing, testing, and deploying FPGA-based systems, accelerating development.
20	Hardware Security Software for VLSI Chips	Design software solutions to analyze and enhance hardware security against side-channel attacks.	Detects vulnerabilities, simulates threats, and implements safeguards to protect chips from unauthorized access and manipulation.

21	Smart Sensors for Real-Time Data Processing	Develop VLSI hardware integrated with software algorithms for real-time analytics in IoT applications.	Combines hardware for signal acquisition with software for immediate data processing, enabling intelligent responses in IoT ecosystems.
22	Chip-to-Cloud Security Solutions	Design VLSI hardware and supporting software for secure data transfer between chips and cloud platforms.	Ensures encryption and secure authentication mechanisms for seamless and protected communication between devices and cloud servers.
23	Edge AI Chips with On-Device Learning	Create hybrid architectures combining VLSI hardware and ML software for edge AI devices.	Performs machine learning computations locally, reducing reliance on cloud connectivity and enabling real-time decision-making.
24	Self-Healing VLSI Circuits	Design circuits capable of detecting and self-correcting faults using integrated software algorithms.	Employs hardware redundancy and intelligent software to autonomously resolve errors, ensuring uninterrupted operation.
25	AI-Driven EDA Toolchain	Develop an AI-enhanced electronic design automation toolchain for VLSI hardware-software co-design.	Integrates AI for synthesis, placement, routing, and verification tasks, providing a comprehensive environment for efficient VLSI design.