PANIMALAR ENGINEERING COLLEGE
An Autonomous Institution

[JAISAKTHI EDUCATIONAL TRUST]

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

INDIA'S WOMEN CENTRIC NATIONAL LEVEL 24 – HOUR HACKATHON
TECHDIVATHON – 2.0
She blooms. She leads. She conquers

Domain: 5G

Problem Statements:

S.No	Title	Problem Statement	Description
1	Multi-Band Co-Integrated 5G/6G Antenna Arrays	Integrating multi-band 5G/6G antennas is difficult due to crosstalk and space constraints.	Design a compact, low-crosstalk antenna array that supports both sub-6 GHz and mmWave bands for flexible small cell, vehicular, and fixed broadband deployments.
2	Reconfigurable Metasurface Antenna for 5G Beam Steering	Conventional 5G antennas lack on-the-fly reconfigurability for beam direction.	Develop a metasurface-based antenna capable of dynamic beam steering and frequency agility to boost 5G coverage in variable environments.
3	mmWave Reflector Arrays for Underground Connectivity	mmWave signals struggle through dense materials and underground structures.	Engineer deployable reflector arrays for tunnels and underground stations that redirect mmWave signals and sustain high-speed 5G.
4	Energy Harvesting Small Cells for Smart Cities	Small cell deployment is hindered by power and maintenance costs.	Build small cell base stations powered by solar, ambient RF, or kinetic energy that self-maintain and adapt dynamically to network demand.
5	Low-Cost Beamforming Module for Consumer 5G Devices	Beamforming hardware remains expensive and inaccessible to low-cost devices.	Design an affordable plug-in beamforming module for use in budget smartphones, routers, and wearables, improving connection stability and speed.
6	5G Mesh Topology for Disaster Recovery	Communication infrastructure collapses during large-scale disasters.	Develop a rapidly deployable mesh network using 5G relays to re-establish wide-area connectivity in disaster-hit zones.
7	AI-Optimized mmWave Handover for High-Speed Transit	Handover interruptions occur in mmWave-enabled vehicles and trains.	Implement AI-powered algorithms to predict and optimize mmWave handover, ensuring stable 5G access for high-speed transport systems.
8	Integrated 5G/IoT Device Identity Management	IoT devices on 5G often have weak identity/authorization protocols.	Build a hardware/software solution for robust device identity and zero-trust onboarding in large-scale 5G IoT deployments.

9	Ultra-Reliable Low Latency 5G for Remote Surgery	Existing 5G setups can't guarantee absolute latency/downtime for telemedicine.	Engineer a fail-safe wireless network architecture for real-time remote surgical control, supporting fallback, redundancy, and health data security
10	Transparent Building Materials for mmWave Penetration	Walls and glass drastically attenuate mmWave signals in buildings.	Research and prototype window/wall materials engineered to pass or redirect mmWave, maximizing indoor high-speed coverage without repeaters.
11	AI-Based 5G Network Slicing for Industrial Use	Industrial private networks struggle to dynamically allocate bandwidth.	Develop an AI-based real-time slicing system for 5G that continuously tunes capacity and QoS across machines, sensors, and robotics floors.
12	Automotive Safety Mesh Using 5G Edge	Car-to-car and infrastructure comms lack edge-level verification/security.	Create an edge-managed mesh network for vehicle-to-everything, with continuous integrity monitoring and incident reporting via 5G.
13	Cross-Border 5G Roaming Optimization	Users face slowdowns and security gaps during international roaming.	Develop a cross-border 5G service that automatically optimizes networks, bandwidth, and security within seconds of crossing boundaries.
14	Low-Power 5G Sensor Tag for Supply Chains	Supply chain sensors need ultra-long life and wide-area support.	Engineer battery-free, low-power mmWave sensor tags that ping environmental/position updates throughout global logistics chains.
15	Holographic Beamforming for 5G Stadium Experiences	Mass events suffer from uneven coverage and poor immersive experiences.	Engineer holographic beamforming arrays that create personalized, high-fidelity 5G streams for thousands of simultaneous users in stadiums and venues
16	Edge-Driven Fraud Detection in 5G Mobile Payments	Real-time payment fraud is elusive in distributed mobile transactions.	Create an edge-hosted analytics module for instant detection, flagging, and blocking of suspicious payment behavior over 5G.
17	Automated Green Energy Scheduling for 5G Tower Grids	High energy use makes tower grids unsustainable.	Develop an AI-driven scheduler that dynamically shifts 5G tower power demands to optimal solar/wind times, reducing fossil fuel reliance.
18	Core Network Encryption	Emerging quantum computers threaten current 5G encryption standards.	Design a post-quantum cryptographic suite integrated into 5G core networks, ensuring long-term security for mission-critical communications and data transport.
19	AI ChatBot for 5G User Network Troubleshooting	Manual network support is slow and labor-intensive.	Build an AI chatbot capable of diagnosing, simulating, and resolving user network issues instantly, making repair/recovery autonomous.
20	Smart School IoT Safety Using 5G Private Networks	School campus IoT security and emergency response are fragmented.	Design an integrated safety management system with private 5G coverage for instant alerts, emergency signals, and predictive threat detection.
21	Next-Gen 5G eSIM Platform for Global Mobility	Traditional SIM cards limit flexibility, tracking, and user privacy.	Build a 5G eSIM ecosystem for seamless, secure, privacy-preserving mobile and IoT onboarding worldwide, with automated carrier switching.
22	Automated mmWave Network Planning Tool for Rural Expansion	Rural regions lack automated tools to plan coverage cost-effectively.	Create a planning tool using satellite, drone, and local data to optimize mmWave base station positions for rural/remote network expansion.

23	Smart Livestock Monitoring Using 5G Edge AI	Farm animal health and resource tracking require constant coverage.	Build a scalable platform using 5G edge AI to monitor, analyze, and alert farmers in real time on livestock status, location, and biometrics.
24	Self-Healing AI-Driven 5G Network Infrastructure	Outages and damage in 5G infrastructure slow recovery times.	Invent self-healing network modules using AI to automatically detect, reroute, and repair broken nodes and links in 5G deployments.
25	Immersive Remote Education Using 5G and Mixed Reality	Quality distance learning is still limited by latency and poor immersion.	Develop a multi-user educational platform using 5G and MR to enable real-time classes, labs, and field trips

Reviewer's Digital Signature

Reviewer's Name:
Position:
Organization:
Date:

Digital Signature: