AMARAVATI QUANTUM VALLEY HACKATHON 2025

AQVH 2025 - PROBLEM STATEMENTS

S.No	Problem Statement	Theme	Category	P S Number
1	Design a basic QRNG using a quantum circuit that utilizes superposition and measurement to generate random bits	**Quantum Random Number Generator (QRNG)**	**Hardware/Software**	**AQVH910**
2	Develop a basic simulator for **Quantum Key Distribution (BB84 Protocol)** to show how secure communication can be achieved using quantum principles	**QKD Demonstration Simulator**	**Hardware/Software**	**AQVH911**
3	Develop a tool/app that accepts a multi-qubit quantum circuit, isolates single-qubit reduced density matrices using partial tracing, and visualizes each qubit's mixed state on the Bloch sphere.	**Quantum State Visualizer**	**Software**	**AQVH912**
4	Simulate a superdense coding protocol where two classical bits are transmitted using a single qubit with prior entanglement	**Decoding Superdense Coding**	**Software**	**AQVH913**
5	Use quantum simulation (like VQE) to estimate the ground state energy of a small molecule like Hydrogen (H_2)/LiH	**Quantum Chemistry: Small Molecule Energy Estimator**	**Software**	**AQVH914**
6	Build a dashboard that shows live/public quantum computing jobs from IBM Quantum	**Quantum Jobs Tracker**	**Software**	**AQVH915**
7	Maximize returns while minimizing risk (Sharpe ratio) with QAOA	**Quantum Optimization: Portfolio Optimization**	**Software**	**AQVH916**
8	Classify future market direction with VQC	**Quantum ML: FTSE 100 Forecasting**	**Software**	**AQVH917**
9	Identify anomalies in transaction data using QML	**Quantum ML: Fraud Detection**	**Software**	**AQVH918**
10	Quantum path planning for delivery vehicles	**Logistics: Fleet Optimization**	**Software**	**AQVH919**