AAVARTAN'25-26

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VIGYAAN

DEPARTMENT OF MECHANICAL ENGINEERING

PROBLEM STATEMENTS

MECH01: Autonomous Mobile Robot for Smart Warehousing

Develop an intelligent Autonomous Mobile Robot capable of safely navigating dynamic warehouse environments while accurately identifying inventory items in real time. The solution should combine robust localization, adaptive obstacle avoidance and reliable product recognition to support modern logistics operations without reliance on fixed paths or external computing infrastructure. The system must maintain operational safety, efficiency and seamless data exchange with warehouse inventory systems.

MECH02: Smart Actuator System for Bed Sore Prevention

Develop an automated pressure-relief actuator system that can be installed beneath a standard hospital or home-care mattress to help prevent pressure ulcers in bedridden patients. The system should dynamically redistribute body pressure by smoothly altering support zones over time, reducing caregiver workload and avoiding disturbance to patient rest. The design must ensure safe operation, comfort compatibility and long-term reliability in continuous use.

MECH03: Gutter Cleaning Rover

Develop a remote-operated gutter-cleaning rover that can move through standard household gutters and remove compacted debris without requiring homeowners to climb ladders. The system should safely navigate wet, narrow and debris-filled environments while breaking up and clearing obstructions toward the downspout. The design must

prioritize safety, reliability and ease of operation to reduce household maintenance risks.

MECH04: <u>Autonomous Drone System for Precision Reforestation</u>

Develop an autonomous drone-based planting system capable of accurately deploying seed pods across difficult or inaccessible terrain. The solution should combine precise navigation, reliable payload dispensing and efficient mission planning to support scalable reforestation efforts while reducing the cost, time and safety risks associated with manual planting.

MECH05: <u>Smart Precision Irrigation System</u>

Develop an IoT-based smart irrigation system that automatically adjusts water delivery based on real-time soil moisture conditions rather than fixed schedules. The solution should minimize water wastage, prevent over-irrigation and improve crop health by using reliable soil sensing, efficient wireless communication and intelligent control of multiple irrigation zones.

MECH06: <u>Real-Time Water Quality Forecasting and Decision Support System</u>

Develop a real-time water quality forecasting platform that combines in-situ sensing with satellite observations and predictive modelling to support proactive river management. The system should continuously monitor key water quality parameters, detect pollution events early and forecast future conditions to guide timely decision-making for public health and environmental protection.