SNS COLLEGE OF TECHNOLOGY

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COIMBATORE-641 035, TAMIL NADU

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B.E/B.Tech- Internal Assessment – III
Academic Year 2024-2025 (Even Semester)
Fourth Semester
Mechanical Engineering
23MET207– INTERNET OF THINGS FOR PRODUCTION SYSTEM

A

ANSWER KEY

PART – A (5 × 2 = 10 Marks)

1. Define AGV:
AGV (Automated Guided Vehicle) is a battery-powered, driverless vehicle used to transport materials in manufacturing and warehouse environments. It operates using navigation technologies like lasers, magnets, or vision systems to follow predefined paths.

2. Define Automation:
Automation refers to the use of control systems, such as computers or robots, to operate machines and processes with minimal or no human intervention. It improves efficiency, accuracy, and productivity.

3. Mention the purpose of Amplification in DAS:
The purpose of amplification in a Data Acquisition System (DAS) is to boost weak signals from sensors or transducers to levels suitable for analog-to-digital conversion and accurate data processing.

4. Smart Metering using IoT – Define:
Smart metering using IoT involves the use of internet-connected devices to measure, monitor, and transmit utility usage (such as electricity, water, or gas) data in real time. It enhances billing accuracy, energy efficiency, and resource management.

5. Mention purpose of factory digitalization:
The purpose of factory digitalization is to integrate digital technologies into manufacturing processes to increase operational efficiency, enable real-time monitoring, enhance product quality, and support data-driven decision-making.

PART – B (2 × 13 = 26 Marks) & (1 × 14 = 14 Marks)

6. (a) Enumerate types of AGVs used in Production System:

1. **Towing AGVs:** Pull carts or trailers carrying loads between points.
2. **Unit Load AGVs:** Designed to carry specific units like pallets or containers.
3. **Forklift AGVs:** Mimic traditional forklifts and can lift and transport materials.
4. **Assembly AGVs:** Operate along assembly lines to move parts or tools.
5. **Hybrid AGVs:** Perform multiple roles such as towing and lifting.
6. **Autonomous Mobile Robots (AMRs):** Use AI, sensors, and mapping to navigate freely in dynamic environments.

OR

6. (b) IoT Smart Energy Management – Illustrate it:

Concept:
IoT-based smart energy management systems use sensors, smart meters, and controllers to monitor and optimize energy consumption.

Example:
A factory installs IoT sensors on heavy machinery. These sensors track energy usage and transmit data to a cloud-based platform. AI algorithms analyze the data and adjust usage patterns during peak hours to reduce costs.

Benefits:

- Real-time energy monitoring
- Reduction in electricity bills
- Detection of inefficient machines
- Sustainability through energy conservation

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7. (a) Challenges in Implementing Cybersecurity in IoT Devices & Practical Solutions:

Challenges:

1. Limited processing power for encryption
2. Lack of standardized protocols
3. Insecure network communication
4. Weak authentication mechanisms
5. Physical security vulnerabilities

Solutions:

- Use lightweight encryption methods
- Implement secure boot processes

- Apply frequent firmware updates
- Use strong authentication and role-based access
- Network segmentation and firewalls

OR

7. (b) Industrial Automation using Robots – Case Study:

Case Study: ABB Robotics in Automotive Assembly

Problem:
Manual assembly was time-consuming, error-prone, and hazardous.

Solution:
ABB implemented industrial robotic arms for tasks like welding, painting, and part assembly in car manufacturing plants.

Results:

- Increased throughput
- Improved consistency and quality
- Reduced workplace injuries
- 24/7 operational capability

Conclusion:
Industrial robots significantly improved productivity and safety in the automotive industry through automation.

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8. (a) Define Predictive Maintenance & Analyse its Importance:

Definition:
Predictive Maintenance (PdM) uses real-time data from sensors and analytics to predict equipment failures before they occur, enabling timely maintenance.

Importance:

- Reduces unplanned downtime
- Increases machine lifespan
- Lowers maintenance costs
- Improves safety and productivity
- Supports lean manufacturing

Technologies Used:

- IoT sensors (vibration, temperature)
- Machine Learning for failure prediction
- Cloud platforms for data visualization

OR

8. (b) IoT Smart Inventory Management – Case Study:

Case Study: Walmart's IoT Inventory System

Problem:
Manual tracking led to stock errors and overstock issues.

Solution:
Walmart used IoT sensors, RFID tags, and smart shelves to track inventory in real-time.

Process:

- RFID tags provide product identification
- IoT sensors monitor stock levels
- Automated alerts trigger reorders

Benefits:

- Reduced excess inventory and storage costs
- Improved accuracy in stock tracking
- Minimized human errors
- Faster response to demand changes

Conclusion:
IoT smart inventory management helps reduce manufacturing costs and improves supply chain efficiency.