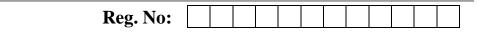


# SNS COLLEGE OF TECHNOLOGY

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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

# ANSWER KEY

# $PART - A (5 \times 2 = 10 Marks)$

# 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

# **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.

# 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

# 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.

#### OR