# SNS COLLEGE OF TECHNOLOGY

*(An Autonomous Institution)*
*Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai*
*Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &*
*Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)*
COIMBATORE-641 035, TAMIL NADU

**Reg. No:** | | | | | | | | | | | | |

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

B

## PART – A (5 × 4 = 20 Marks)

### 1. Mention advantages of AGV in production system

- **Improved Efficiency**: AGVs automate material handling, reducing time and increasing workflow speed.
- **Labor Cost Reduction**: Fewer human operators are required for transport tasks.
- **Enhanced Safety**: AGVs reduce workplace accidents by following pre-programmed safe routes.
- **Flexibility**: Easily reconfigurable for different production layouts and tasks.

---

### 2. List the importance of cybersecurity in Industry 4.0

- **Data Protection**: Prevents unauthorized access to sensitive industrial data.
- **Ensures System Integrity**: Maintains the trustworthiness of interconnected devices and processes.
- **Operational Continuity**: Minimizes downtime caused by cyberattacks.
- **Compliance**: Meets legal and regulatory cybersecurity standards.
- **Safeguards IP**: Protects industrial secrets and proprietary technologies.

---

### 3. Mention the importance of Signal Conditioning in DAS

- **Noise Filtering**: Removes unwanted electrical noise for clearer signals.
- **Signal Amplification**: Enhances weak sensor signals to readable levels.
- **Isolation**: Protects DAS from high-voltage spikes or ground loops.
- **Analog-to-Digital Conversion**: Converts sensor data into digital form suitable for processing.

---

### 4. Discuss the role of automation in enhancing quality of parts

- **Consistent Quality**: Automated machines produce parts with high precision and repeatability.
- **Reduced Errors**: Minimizes human error through programmed instructions.
- **Real-Time Inspection**: Sensors and cameras detect defects instantly.
- **Process Optimization**: Feedback loops allow continuous improvement in production.

---

### 5. Analyse how predictive maintenance is useful to reduce the cost of manufacturing

- **Prevents Unexpected Downtime**: Equipment is maintained before failure, reducing disruption.
- **Extends Equipment Life**: Regular condition-based maintenance avoids premature wear.
- **Reduces Maintenance Costs**: Focuses efforts only where needed, unlike routine or reactive maintenance.
- **Improves Productivity**: Maximizes machine availability and production throughput.

---

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

### 6. (a) Internet of Things for Plant Automation – Case Study

**Case Study: Smart Factory with IoT Integration**

**Context**: A car manufacturing plant implemented IoT-based automation.

**Implementation**:

- IoT sensors were embedded in machines to monitor temperature, vibration, and load.
- A centralized system collected real-time data.
- AI-based analytics predicted failures and optimized workflow.
- Automated guided vehicles (AGVs) transported parts based on sensor data.

**Benefits**:

- Downtime reduced by 30%.
- Production increased by 25%.
- Defective product rate decreased due to real-time monitoring.

---

**OR**

### 6. (b) Analyse major cybersecurity threats in IoT and mitigation

**Threats**:

- **Device Hijacking**: Unauthorized control of IoT devices.
- **Data Breaches**: Theft of sensitive production or user data.
- **Denial of Service (DoS)**: Crashes the system by overloading with requests.
- **Firmware Exploits**: Vulnerabilities in outdated device firmware.
- **Man-in-the-Middle Attacks**: Interception of data between devices.

**Mitigation**:

- **Strong Authentication**: Multi-factor and encrypted logins.
- **Regular Firmware Updates**: Patch known vulnerabilities.
- **Network Segmentation**: Isolate critical IoT networks.
- **End-to-End Encryption**: Secure data transmission.
- **Monitoring & Incident Response**: Real-time threat detection systems.

---

## 7. (a) Smart Tracking of Components in Production Line Using IoT

**Application**:

- RFID and barcode scanners track parts at each workstation.
- IoT gateways collect and transmit data to the cloud.
- Dashboards show real-time position and status of every component.
- Alerts sent if a part is delayed or misplaced.

**Benefits**:

- Improved traceability.
- Reduced loss and misplacement.
- Enhanced inventory control.
- Streamlined workflow.

---

**OR**

## 7. (b) Sensor Data Acquisition – Block Diagram and Explanation

**Block Diagram Components**:

1. **Sensor** – Converts physical input (e.g., temperature) into analog signals.
2. **Signal Conditioning Unit** – Filters, amplifies, and converts signals.
3. **Multiplexer (MUX)** – Selects one signal among many.
4. **Analog-to-Digital Converter (ADC)** – Converts analog signals to digital.
5. **Processor/Controller** – Analyzes and stores the data.
6. **Storage/Display** – Stores data or displays it for monitoring.

---

## 8. (a) Quality Control Using IoT – Case Study

**Case Study: Electronics Manufacturing**

**Context**: A PCB assembly company adopted IoT for quality assurance.

**Implementation**:

- Vision sensors inspect solder joints.
- IoT-enabled machines report component placement accuracy.
- AI models detect anomalies in real time.

**Results**:

- Defect rate reduced by 40%.
- Inspection time cut by 50%.
- Continuous improvement based on historical data analytics.

---

**OR**

## 8. (b) IoT Smart Energy Management – Illustration

**Concept**:

- IoT sensors monitor real-time energy usage across machinery.
- Smart meters and actuators control lighting and HVAC systems.
- AI algorithms optimize equipment scheduling based on usage patterns.

**Example**:

- A manufacturing plant saved 20% energy using smart lighting that adapts to occupancy.
- Machines automatically shut down during idle periods.

**Benefits**:

- Reduced electricity bills.
- Lower carbon footprint.
- Enhanced sustainability and compliance.

---