SNS COLLEGE OF TECHNOLOGY

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Answer Key (IA3) Set B

PART – A (5 x 2 = 10 Marks)

1. **Mention advantages of AGV in production system.** (CO4, UND)

Answer:

- Increased efficiency through automated material transport.
- Reduced labor costs and human errors.

2. **List the importance of cybersecurity in Industry 4.0.** (CO4, UND)

Answer:

- Protects sensitive production data from breaches.
- Ensures operational continuity by preventing cyberattacks.

3. **Mention the importance of Signal Conditioning in DAS.** (CO5, REM)

Answer:

Signal conditioning in Data Acquisition Systems (DAS) filters, amplifies, and converts sensor signals for accurate data processing.

4. **Discuss the role of automation in enhancing quality of parts.** (CO5, ANA)

Answer:

Automation ensures consistent part quality by using precise machines and real-time quality checks (e.g., vision systems), reducing defects.

5. **Analyse how predictive maintenance is useful to reduce the cost of manufacturing.** (CO5, ANA)

Answer:

Predictive maintenance reduces costs by preventing unexpected breakdowns, minimizing repair expenses, and optimizing maintenance schedules.

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

6. **(a) Internet of Things for Plant Automation. Case study it.** (13 Marks, CO4, REM)

Answer:

Case Study: **Siemens' Amberg Electronics Plant**

- **Context**: Siemens uses IoT for plant automation in electronics manufacturing.
- **Implementation**: IoT sensors monitor machines, production lines, and energy usage. Data is analyzed on Siemens' MindSphere platform for real-time control.
- **Outcome**: Achieved 99.9988% defect-free production and 25% faster throughput.

Description: IoT enables seamless automation, integrating machines and analytics for efficiency and quality.

(OR)

(b) Analyse the major cybersecurity threats in the Internet of Things (IoT) ecosystem. How can these threats be mitigated? (13 Marks, CO4, ANA)

Answer:

Threats:

- **Unauthorized Access**: Weak passwords allow device hacking.
- **Data Breaches**: Unencrypted data is intercepted.
- **DDoS Attacks**: IoT devices are used in botnets.
- **Firmware Exploits**: Outdated software vulnerabilities.

Mitigation:

- Strong authentication (e.g., two-factor authentication).
- Encryption protocols (e.g., AES for data security).
- Network segmentation to limit attack spread.
- Regular software updates and vulnerability scans.

Analysis: These measures ensure IoT ecosystem security, critical for Industry 4.0 reliability.

7. **(a) Smart Tracking of Components in Production line using IoT. Apply it using IoT.** (13 Marks, CO5, ANA)

   Answer:

   Concept: IoT-based smart tracking uses RFID and sensors to monitor components on production lines.

   Implementation:

- **Components**: RFID tags on parts, RFID readers, Arduino for processing, Wi-Fi module for cloud connectivity.
- **Working**: RFID tags identify components, readers track their location, and data is sent to a cloud dashboard for real-time monitoring.
- **Application**: Ensures correct assembly sequence and detects bottlenecks.

Example: In automotive production, IoT tracks engine parts, reducing assembly errors by 30%.
Analysis: Enhances traceability and efficiency in complex production lines.

(OR)

(b) Illustrate Sensor Data Acquisition with block diagram. (13 Marks, CO5, UND)

Answer:

Concept: Sensor Data Acquisition (DAQ) collects and processes sensor data for analysis.

Block Diagram: [Describe a diagram with: Sensor → Signal Conditioning (amplifier, filter) → Analog-to-Digital Converter (ADC) → Microcontroller → Communication Module → Cloud/Storage.]

Components:

- **Sensor**: Detects parameters (e.g., temperature).
- **Signal Conditioning**: Amplifies/filters signals.
- **ADC**: Converts analog to digital signals.
- **Microcontroller**: Processes data.
- **Communication**: Sends data to cloud (e.g., via MQTT).

Illustration: In a factory, DAQ collects motor vibration data for predictive maintenance.

8. **(a) Quality Control using IoT – Case study it with real-time examples.** (14 Marks, CO4, APP)

   Answer:

   Case Study: **Intel's IoT Quality Control in Semiconductor Manufacturing**

- **Context**: Intel uses IoT for real-time quality control in chip production.
- **Implementation**: Vision sensors and IoT devices inspect wafers for defects, with data analyzed on a cloud platform to flag anomalies instantly.

- **Outcome**: Reduced defect rates by 20% and improved yield by 15%.

Application: IoT enables automated, precise quality checks, ensuring high standards in manufacturing.

(OR)

(b) IoT Smart Energy Management. Illustrate it. (14 Marks, CO5, APP)
Answer:
Concept: IoT smart energy management optimizes energy use in manufacturing.
Components:

- Sensors (e.g., power meters).
- Microcontrollers (e.g., Raspberry Pi).
- Cloud platform for analytics.
- Actuators (e.g., smart switches).

Working: Sensors monitor machine energy consumption, data is analyzed to detect inefficiencies, and actuators adjust operations (e.g., turn off idle machines).
Example: A textile plant uses IoT to cut energy costs by 18% via optimized lighting and machinery.
Illustration: Enhances sustainability and reduces operational costs.