SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
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COIMBATORE-641 035, TAMIL N

Answer Key

IoT for Electrical Sciences - Internal Assessment III

PART A (5×2=10 Marks)

1. **Sketch the functional block diagram of an Accelerometer.**

   Sensing Element (MEMS) → Signal Conditioning → Analog-to-Digital Converter (ADC) → Microcontroller/Processor → Output Interface (I2C/SPI)

2. **Mention the benefits of a Digital Energy Meter.**

   - **Answer:**
     - High accuracy in energy measurement
     - Real-time data monitoring and logging
     - Remote reading and control (via IoT)
     - Tamper detection and prevention
     - Supports dynamic pricing and demand-response programs

Compare Relay and Contactor.

- **Answer:**

Feature	Relay	Contactor
Power Rating	Low (control circuits)	High (motor/load switching)
Size	Small	Large
Arc Suppression	Minimal	Built-in (for high currents)
Applications	Electronics, automation	Industrial motors, HVAC systems

3. Develop the IoT architecture for a Smart Grid.

Perception Layer (Sensors & Smart Meters) → Network Layer (Wi-Fi/Zigbee/5G/Cellular) → Middleware (Data Processing & Cloud Storage) → Application Layer (Monitoring, Analytics, Control)

4. List the modern applications of IoT used in industry. *(Amazon, 2024)*

- **Predictive Maintenance** (AI-based failure prediction)
- **Smart Inventory Management** (RFID & automated tracking)
- **Energy Optimization** (Smart grids & real-time monitoring)
- **Automated Quality Control** (Vision sensors & AI inspection)
- **Industrial Robotics** (IoT-enabled collaborative robots)

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

6. (a) Construct a block diagram of a Digital Energy Meter with a real-time IoT application.

Block Diagram:

[Energy Measurement Unit] → [Microcontroller] → [Communication Module (Wi-Fi/GSM/Zigbee)]

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[Cloud Server (AWS/Azure)] → [Mobile App/Dashboard] → [Utility Company]

Real-time IoT Application:

Smart Billing: Automatic energy usage reports & dynamic pricing.

Remote Disconnect/Reconnect: Utility can control supply via IoT.

OR

(b) Explain in detail about the Gyroscope and its classifications with suitable applications.

- **Definition:** Measures angular velocity (rotation in 3D space).
- **Classifications:**

1. **MEMS Gyroscope** (Used in smartphones, drones)
2. **Fiber Optic Gyroscope (FOG)** (Aerospace, military navigation)
3. **Ring Laser Gyroscope (RLG)** (Aircraft inertial navigation)

- **Applications:**

- **Consumer Electronics** (Smartphone screen rotation)
- **Automotive** (Electronic Stability Control in cars)
- **Aviation** (Flight control systems)

7. (a) Illustrate the selection of proper sensor devices for commercial Building Automation.

- **Answer:**

Requirement	Sensor Type	Purpose
Temperature Control	Thermistor/DHT22	HVAC regulation
Occupancy Detection	PIR Motion Sensor	Smart lighting & security
Air Quality	CO_2 & VOC Sensors	Ventilation control
Energy Monitoring	Smart Energy Meter	Electricity usage tracking

OR

(b) Explain the automation in the Industrial aspect of IoT with a neat explanation.

- **Smart Manufacturing:**
  - **Predictive Maintenance** (Vibration sensors detect machine wear)
  - **Automated Assembly Lines** (IoT-enabled robotic arms)
- **Supply Chain Optimization:**
  - **RFID Tracking** (Real-time inventory management)
  - **Smart Warehousing** (Automated guided vehicles - AGVs)

8. (a) Make use of a suitable example; explain how IoT is used for communicating with smart grids. *(Google, 2023)*

- **Example:** Smart meters in homes send real-time electricity usage data to utility companies via **cellular/Wi-Fi networks**.
- **Process:**

1. **Data Collection** (Smart meters record consumption)
2. **Transmission** (Sent to cloud via IoT gateways)
3. **Analysis** (AI predicts demand & detects faults)
4. **Action** (Utility adjusts supply or sends alerts)

OR

(b) Develop the block diagram of a touch control device used for a particular IoT application. *(Apple, 2024)*

Block Diagram

[Touch Sensor (Capacitive/Resistive)] → [Signal Conditioning Circuit]

↓

[Microcontroller (ESP32/Arduino)] → [IoT Module (Wi-Fi/BLE)]

↓

[Cloud Server] → [Mobile App/Web Dashboard]

Application:

Smart Home Control Panel (Touch-based lighting, HVAC control)