COURSE CODE: 23CS1301 **R23**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY: PUTTUR

[AUTONOMOUS]

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QUESTION BANK

[DESCRIPTIVE]

Subject with Code: Sensors and Internet of Things[23CS1301]

Course & Branch: B.Tech.–CIA

Regulation: R23 **Year & Sem:** III-B.Tech.& I-Sem

UNIT –I

INTRODUCTION TO SENSORS & INTRODUCTION TO IOT AND USE CASES

1.	a]	Define a transducer and distinguish between a sensor and a transducer.	[L1] [CO1]	[2M]
	b]	What is the role of sensors in IoT? Mention any two types of sensors used in IoT applications.	[L2] [CO1]	[2M]
	c]	Differentiate between a sensor and an actuator with one suitable example for each.	[L2] [CO1]	[2M]
	d]	Define IoT and list any two fundamental building blocks of an IoT system.	[L1] [CO1]	[2M]
	e]	Differentiate between Consumer IoT and Industrial Internet [IIoT] with one example for each.	[L2] [CO1]	[2M]
2.	a]	Define a sensor and transducer. Explain the difference between a sensor and a transducer with suitable examples.	[L2] [CO1]	[5M]
	b]	Explain the classification of transducers based on different criteria with suitable examples.	[L2][CO1]	[5M]
3.	a]	Explain the role of sensors in IoT systems with a suitable block diagram.	[L2][CO1]	[5M]
	b]	Describe any five types of sensors used in IoT applications and mention their applications.	[L2] [CO1]	[5M]
4.	a]	Explain the important characteristics and specifications of sensors such as sensitivity, accuracy, resolution, range and response time.	[L2] [CO1]	[5M]
	b]	Explain the important considerations involved in the design of a sensor for an IoT application.	[L3][CO1]	[5M]
5.	a]	Draw and explain the basic architecture of a sensor system, showing sensing, signal conditioning and communication stages.	[L2] [CO1]	[5M]
	b]	Explain the role of signal conditioning in a sensor architecture with suitable examples.	[L2] [CO1]	[5M]
6.	a]	What is an actuator? Explain its role in an IoT system with a suitable example.	[L2] [CO1]	[5M]
	b]	Explain the classification and types of actuators used in IoT systems with suitable examples.	[L2] [CO1]	[5M]
7.	a]	Explain the basic concepts of IoT and describe its major characteristics.	[L2] [CO1]	[5M]
	b]	Explain the fundamental building blocks of IoT with a neat block diagram.	[L2] [CO1]	[5M]
8	a]	Differentiate between Consumer IoT and Industrial Internet of Things [IIoT] with suitable examples.	[L4] [CO1]	[5M]

	b]	Explain how sensors, communication networks, cloud computing and actuators work together in an IoT system.	[L3] [CO1]	[5M]
9	a]	Explain the complete IoT architecture from sensing devices to cloud and application layer.	[L2] [CO1]	[5M]
	b]	Explain the use of IoT in smart homes and smart cities with suitable examples.	[L3 [CO1]	[]5M]
10	a]	Discuss the major IoT use cases in healthcare and agriculture.	[L3] [CO1]	[5M]
	b]	Explain the applications of IoT in manufacturing and industrial automation.	[L3] [CO1]	[5M]
11	a]	Analyze the role of IoT in transportation and logistics and explain any two practical use cases.	[L4] [CO1]	[5M]
	b]	Select a suitable combination of sensors, actuators and communication technologies for a smart agriculture IoT system and justify your selection	[L3] [CO1]	[5M]

UNIT –II
ARCHITECTURE

1.	a]	What is an IoT reference architecture? Mention any two of its important layers or components.	[L1] [CO2]	[2M]
	b]	Define Industrial Internet Reference Architecture [IIRA] and state its purpose in industrial IoT systems.	[L2][CO2]	[2M]
	c]	What is Edge Computing? Mention any two advantages of using edge computing in IoT.	[L2] [CO2]	[2M]
	d]	What is an IoT Gateway? State any two functions performed by an IoT gateway.	[L1] [CO2]	[2M]
	e]	Differentiate between data ingestion and data stream processing in an IoT data processing pipeline.	[L4] [CO2]	[2M]
2.	a]	Define IoT reference architecture and explain its importance in designing IoT systems.	[L2] [CO2]	[5M]
	b]	Explain the different layers of a typical IoT reference architecture with a neat diagram.	[L2] [CO2]	[5M]
3.	a]	Explain the major components and functional blocks of an IoT reference architecture.	[L2] [CO2]	[5M]
	b]	Describe the Industrial Internet Reference Architecture [IIRA] and its importance in Industrial IoT.	[L2] [CO2]	[5M]
4.	a]	Explain the major viewpoints and domains of IIRA with suitable examples.	[L2] [CO2]	[5M]
	b]	Differentiate between a general IoT reference architecture and Industrial Internet Reference Architecture.	[L4] [CO2]	[5M]
5.	a]	Define Edge Computing and explain its importance in IoT applications.	[L2] [CO2]	[5M]
	b]	Explain the advantages of Edge Computing over cloud-only processing in IoT systems.	[L4] [CO2]	[5M]
6.	a]	Explain the architecture and working of an Edge Computing system with a suitable block diagram.	[L2] [CO2]	[5M]
	b]	What is an IoT Gateway? Explain its major functions in an IoT system.	[L2] [CO2]	[5M]

7.	a]	Explain the role of an IoT Gateway in protocol conversion, data filtering and device management.	[L2][CO2]	[5M]
	b]	Differentiate between IoT Gateway and Edge Computing based on their functions and applications.	[L4] [CO2]	[5M]
8.	a]	Define Data Ingestion. Explain the different stages involved in an IoT data ingestion pipeline.	[L2][CO2]	[5M]
	b]	Explain the IoT data processing pipeline from data collection to storage and visualization.	[L2] [CO2]	[5M]
9.	a]	Explain the role of data filtering, transformation and aggregation in an IoT data processing pipeline.	[L3] [CO2]	[5M]
	b]	What is Data Stream Processing? Explain its importance in real-time IoT applications.	[L2] [CO2]	[5M]
10.	a]	Differentiate between batch processing and stream processing with suitable IoT examples.	[L4] [CO2]	[5M]
	b]	Explain how real-time data stream processing can be used for monitoring industrial machines.	[L3][CO2]	[5M]
11.	a]	Analyze the role of Edge Computing and IoT Gateways in reducing latency and network bandwidth requirements.	[L4] [CO2]	[5M]
	b]	Design a suitable IoT data pipeline for a smart factory, including sensors, gateway, edge processing, cloud storage and data stream processing.	[L4][CO2]	[5M]

UNIT –III
SENSORS AND INDUSTRIAL SYSTEMS

1	a]	Define a sensor and a transducer. Give one example of each.	[L1] [CO3]	2M
	b]	What is the purpose of integrating sensors with sensor processing boards? Mention any two functions of a sensor processing board.	[L2] [CO3]	2M
	c]	What is an Industrial Data Acquisition System [DAS]? Mention any two of its major components.	[L1] [CO3]	2M
	d]	Define an Industrial Control System [ICS] and state any two of its functions.	[L2] [CO3]	2M
	e]	Differentiate between an Industrial Data Acquisition System [DAS] and an Industrial Control System [ICS].	[L2] [CO3]	2M
2	a]	Define sensor and transducer. Explain the differences between them with suitable examples.	[L2] [CO3]	[5M]
	b]	Explain the classification of sensors and transducers based on their operating principle with examples.	[L2] [CO3]	[5M]
3	a]	Explain the important characteristics of sensors such as sensitivity, accuracy, resolution, range and response time.	[L2] [CO3]	[5M]
	b]	Describe the working principles of any five commonly used industrial sensors with suitable applications.	[L2] [CO3]	[5M]
4	a]	Explain the basic sensor signal-processing chain from sensing element to digital output.	[L2] [CO3]	[5M]
	b]	Explain the procedure for integrating a sensor with a sensor processing board.	[L3] [CO3]	[5M]
5	a]	Draw and explain the block diagram of a sensor processing board, showing signal conditioning, ADC, processor and communication interfaces.	[L2] [CO3]	[5M]

	b]	Explain the role of signal conditioning circuits when interfacing sensors with processing boards.	[L2] [CO3]	[5M]
6	a]	Explain the importance of ADC and DAC in sensor interfacing and processing systems.	[L2] [CO3]	[5M]
	b]	Explain the steps involved in calibrating a sensor connected to a processing	[L3] [CO3]	[5M]
7	a]	Define an Industrial Data Acquisition System [DAS] and explain its basic architecture.	[L2] [CO3]	[5M]
	b]	Explain the major components of an industrial data acquisition system and their functions.	[L2] [CO3]	[5M]
8	a]	Explain the role of multiplexers, signal conditioning circuits and ADCs in an industrial data acquisition system.	[L2] [CO3]	[5M]
	b]	Differentiate between single-channel and multi-channel data acquisition systems with suitable industrial applications.	[L4] [CO3]	[5M]
9	a]	Explain the process of acquiring, converting, storing and displaying industrial sensor data.	[L3] [CO3]	[5M]
	b]	Define an Industrial Control System [ICS] and explain its major components.	[L2] [CO3]	[5M]
10	a]	Explain the major functions of industrial control systems in an industrial environment.	[L2] [CO3]	[5M]
	b]	Differentiate between open-loop and closed-loop industrial control systems with suitable examples.	[L4] [CO3]	[5M]
11	a]	Explain the role of PLC, sensors and actuators in an industrial control system.	[L3] [CO3]	[5M]
	b]	Design a basic industrial monitoring and control system using sensors, a data acquisition system, controller and actuators, and explain its operation.	[L4] [CO3]	[5M]

UNIT- IV

NETWORKING AND COMMUNICATION FOR IOT

1.	a]	What is the OSI 7-layer architecture? Mention any two layers and their functions in IoT communication.	[L1] [CO4]	[2M]
	b]	Differentiate between ZigBee and Bluetooth with respect to their use in IoT applications.	[L4] [CO4]	[2M]
	c]	What are Modbus and CAN bus? Mention one application of each in industrial IoT.	[L1] [CO4]	[2M]
	d]	What is MQTT? Identify the roles of the publisher, subscriber, and broker in MQTT communication.	[L2] [CO4]	[2M]
	e]	Differentiate between JSON and Protocol Buffers [Protobuf] as message-encoding formats used in IoT.	[L4] [CO4]	[2M]
2	a]	Explain the seven layers of the OSI reference model and state the function of each layer.	[L2] [CO4]	[5M]
	b]	Explain how the OSI 7-layer architecture can be mapped to an IoT architecture with a suitable diagram.	[L2] [CO4]	[5M]
3	a]	Compare ZigBee and Bluetooth with respect to range, power consumption, data rate, topology, and IoT applications.	[L4] [CO4]	[5M]
	b]	Explain the working principle of ZigBee communication and discuss its applications in IoT systems.	[L2] [CO4]	[5M]

4	a]	Explain Bluetooth communication and discuss its advantages and limitations for IoT applications.	[L2] [CO4]	[5M]
	b]	Explain the concept of serial communication and describe its importance in connecting IoT devices.	[L2] [CO4]	[5M]
5	a]	Differentiate between ZigBee, Bluetooth, and Serial Communication based on communication range, speed, power	[L4] [CO4]	[5M]
	b]	Explain the architecture and working of the Modbus industrial communication protocol.	[L2] [CO4]	[5M]
6	a]	Explain the CAN bus protocol, including its frame structure and arbitration mechanism.	[L2] [CO4]	[5M]
	b]	Compare Modbus and CAN bus with respect to communication method, topology, data transmission, error handling, and applications.	[L4] [CO4]	[5M]
7	a]	Explain the role of TCP/IP and UDP/IP sockets in communication between IoT devices and cloud applications.	[L2] [CO4]	[5M]
	b]	Differentiate between TCP and UDP and discuss their suitability for different IoT communication requirements.	[L4] [CO4]	[5M]
8	a]	Explain the concept of web services and RESTful communication in IoT applications.	[L2] [CO4]	[5M]
	b]	Explain the MQTT protocol, including its publisher, subscriber, broker, topics, and QoS levels.	[L2] [CO4]	[5M]
9	a]	Compare MQTT and WebSockets in terms of communication model, overhead, reliability, and IoT applications.	[L4] [CO4]	[5M]
	b]	Explain the working of WebSockets and discuss their importance in real-time IoT applications.	[L2] [CO4]	[5M]
10	a]	Explain JSON message encoding and illustrate its structure with a suitable IoT sensor-data example.	[L3] [CO4]	[5M]
	b]	Explain Protocol Buffers [Protobuf] and compare them with JSON for IoT message encoding.	[L4] [CO4]	[5M]
11	a]	Design a suitable communication architecture for an IoT system that connects sensors to a cloud application using an appropriate networking protocol. Justify your choice.	[L4] [CO4]	[5M]
	b]	An IoT device periodically sends sensor data to a cloud server. Select and justify suitable protocols at the device, transport, and application layers, considering power consumption, reliability, and data size.	[L4] [CO4]	[5M]

UNIT- V

IOT DATA PROCESSING AND STORAGE

1	a]	Define time-series data and mention any two of its characteristics.	[L1] [CO5]	2M
	b]	What is a time-series database? State one advantage of using it in IoT applications.	[L2] [CO5]	2M
	c]	What is data summarization? Mention one technique used for summarizing IoT data.	[L2] [CO5]	2M
	d]	How can missing values in IoT time-series data be handled? Mention any two methods.	[L3] [CO5]	2M
	e]	Differentiate between an anomaly and an outlier in IoT data.	[L4] [CO5]	2M

2	a]	Define time-series data and explain its important characteristics with suitable IoT examples.	[L2] [CO5]	5M
	b]	Explain the structure of time-series data and discuss the importance of timestamp, value, sampling interval, and measurement unit.	[L2] [CO5]	5M
3	a]	Explain the major characteristics of IoT time-series data, such as temporal ordering, frequency, seasonality, trends, and volume.	[L2] [CO5]	5M
	b]	What is a time-series database [TSDB]? Explain its architecture and important features.	[L2] [CO5]	5M
4	a]	Compare a relational database and a time-series database for storing IoT sensor data.	[L4] [CO5]	5M
	b]	Explain the operations commonly performed in a time-series database, such as insertion, querying, aggregation, and retention.	[L2] [CO5]	5M
5	a]	Explain basic time-series analytics and discuss how mean, minimum, maximum, variance, and moving average can be used for IoT data analysis.	[L3] [CO5]	5M
	b]	Explain the concept of a moving average and describe its usefulness in smoothing IoT sensor data.	[L3] [CO5]	5M
6	a]	Explain trend and seasonality in time-series data with suitable examples from IoT applications.	[L2] [CO5]	5M
	b]	What is data summarization? Explain different techniques used to summarize large volumes of IoT time-series data.	[L2] [CO5]	5M
7	a]	Explain data sketching and discuss how sketches help in processing large-scale IoT data efficiently.	[L2] [CO5]	5M
	b]	Differentiate between data summarization and data sketching with respect to purpose, storage requirements, and accuracy.	[L4] [CO5]	5M
8	a]	Explain the causes of noise in IoT sensor data and describe suitable techniques for reducing noise.	[L2] [CO5]	5M
	b]	Explain different techniques for handling missing values in IoT time-series data, with suitable examples.	[L3] [CO5]	5M
9	a]	A temperature sensor produces the readings 25, 26, 25, 27, 80, 26, 25°C. Identify the possible outlier and explain a suitable method to handle it.	[L4] [CO5]	5M
	b]	Differentiate between noise, missing data, and outliers in IoT sensor data and explain how each can affect data analysis.	[L4] [CO5]	5M
10	a]	Explain the concept of anomaly detection in IoT and discuss its importance in industrial monitoring systems.	[L2] [CO5]	5M
	b]	Explain different approaches for outlier detection, including statistical methods and threshold-based methods.	[L2] [CO5]	5M
11	a]	Design a suitable data-processing pipeline for IoT time-series data that includes data cleaning, summarization, storage, and anomaly detection.	[L4] [CO5]	5M
	b]	An industrial IoT system continuously generates sensor readings containing noise, missing values, and occasional abnormal readings. Propose and justify a suitable data-processing strategy to obtain reliable information.	[L4] [CO5]	5M

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