

SRM VALLIAMMAI ENGINEERING COLLEGE

**(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203**

DEPARTMENT OF COMPUTER APPLICATIONS

QUESTION BANK



III SEMESTER M.C.A

MC4362 - INTERNET OF THINGS

Regulation – 2024

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Prepared by

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SUBJECT : MC4362 INTERNET OF THINGS

SEM/YEAR: III / II

UNIT - I: FUNDAMENTALS OF IOT				
Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.				
UNIT - I: PART – A				
Q. No	Question	BT Level	Competence	Course Outcome
1	What is the Internet of Things (IoT)?	BTL-1	Remember	CO1
2	Define a sensor in the context of IoT.	BTL-1	Remember	CO1
3	What is an actuator in IoT systems?	BTL-1	Remember	CO1
4	What are the key characteristics of IoT?	BTL-1	Remember	CO1
5	Explain the concept of a "smart object" in IoT.	BTL-1	Remember	CO1
6	What role does cloud computing play in IoT?	BTL-1	Remember	CO1
7	What are the main components of an IoT architecture?	BTL-1	Remember	CO1
8	What is the physical design of IoT?	BTL-1	Remember	CO1
9	What are IoT communication models?	BTL-1	Remember	CO1
10	Define IoT communication protocols.	BTL-1	Remember	CO1
11	What is the difference between IPv4 and IPv6 in the context of IoT?	BTL-1	Remember	CO1
12	What is the function of a wireless sensor network (WSN)?	BTL-1	Remember	CO1
13	What is the primary function of an actuator in an IoT system?	BTL-1	Remember	CO1
14	List two examples of IoT-enabled technologies.	BTL-2	Understand	CO1
15	What are the three levels of IoT communication?	BTL-2	Understand	CO1
16	What is the purpose of a RESTful API in IoT?	BTL-2	Understand	CO1
17	Explain the concept of an embedded system in IoT.	BTL-2	Understand	CO1
18	What is an example of IoT in home automation?	BTL-2	Understand	CO1
19	What is the difference between a centralized and decentralized IoT architecture?	BTL-2	Understand	CO1

20	How does IoT impact the agriculture industry?	BTL-2	Understand	CO1	
UNIT - I: PART – B					
Q. No	Question	Mark	BT Level	Competence	Course Outcome
1	Discuss the definition, characteristics, and applications of the Internet of Things (IoT).	16	BTL-3	Apply	CO1
2	Explain the working principles of sensors and actuators in IoT. Provide examples for both.	16	BTL-3	Apply	CO1
3	Describe the physical design of an IoT system and the role of hardware components.	16	BTL-3	Apply	CO1
4	Analyze the various IoT communication protocols used for data transmission in IoT networks.	16	BTL-3	Apply	CO1
5	Elaborate on the different IoT communication models (e.g., device-to-device, device-to-cloud).	16	BTL-3	Apply	CO1
6	Discuss the various types of wireless communication technologies used in IoT, such as Zigbee, Bluetooth, and LoRa.	16	BTL-3	Apply	CO1
7	Explain the importance of cloud computing in IoT applications, focusing on storage, processing, and scalability.	16	BTL-3	Apply	CO1
8	Describe the architecture of an IoT system, highlighting the role of sensors, gateways, cloud services, and user interfaces.	16	BTL-3	Apply	CO1
9	What are IoT-enabled technologies like Wireless Sensor Networks (WSNs)? Discuss their structure and functionality.	16	BTL-4	Analyze	CO1
10	Explain the concept and implementation of an IoT communication API. How do they support IoT applications?	16	BTL-4	Analyze	CO1
11	Discuss the importance of embedded systems in IoT. How do they enable low-power, real-time operations in IoT devices?	16	BTL-4	Analyze	CO1
12	Describe the different levels of IoT and how they contribute to the end-to-end communication and processing of data.	16	BTL-4	Analyze	CO1
13	Discuss the challenges in integrating IoT with existing communication networks and protocols.	16	BTL-4	Apply	CO1
14	How does IoT contribute to smart cities? Explain with examples from transportation, waste management, and energy management.	16	BTL-5	Evaluate	CO1
15	Explain the role of IoT in environmental monitoring and management. Discuss the use of IoT in pollution detection, water quality monitoring, etc.	16	BTL-5	Evaluate	CO1
16	How does IoT impact the energy sector? Provide examples of how IoT is transforming energy efficiency and renewable energy management.	16	BTL-6	Create	CO1
17	Discuss the significance of IoT in agriculture. How do IoT devices help in precision farming and crop monitoring?	16	BTL-6	Create	CO1

18	What are the various levels of IoT architecture (perception, network, application)? Explain their functionalities with examples.	16	BTL-5	Evaluate	CO1
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UNIT II IOT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT II PART – A

Q. No	Questions	BT Level	Competence	Course Outcome
1	What is protocol standardization in the context of IoT?	BTL-1	Remember	CO2
2	Explain the concept of Machine-to-Machine (M2M) communication in IoT.	BTL-1	Remember	CO2
3	What is a Wireless Sensor Network (WSN), and how does it relate to IoT?	BTL-1	Remember	CO2
4	What are SCADA systems, and what role do they play in IoT?	BTL-1	Remember	CO2
5	What is the role of RFID in IoT, and how does it function?	BTL-1	Remember	CO2
6	Explain the term "Unified Data Standards" in IoT.	BTL-1	Remember	CO2
7	What is the IEEE 802.15.4 standard, and why is it important in IoT?	BTL-1	Remember	CO2
8	What is the BACnet protocol used for in IoT?	BTL-1	Remember	CO2
9	What are Modbus protocols used for in IoT systems?	BTL-1	Remember	CO2
10	Explain the KNX protocol in IoT and its applications.	BTL-1	Remember	CO2
11	What is Zigbee, and how is it different from other IoT protocols?	BTL-1	Remember	CO2
12	Define the Network Layer in IoT protocols.	BTL-1	Remember	CO2
13	What is the APS layer in IoT, and how does it relate to the application layer?	BTL-1	Remember	CO2
14	Why is security a major concern in IoT protocol standardization?	BTL-2	Understand	CO2
15	What are the main challenges of IoT protocol standardization?	BTL-2	Understand	CO2
16	How does SCADA interact with IoT in industrial control systems?	BTL-2	Understand	CO2
17	What is the purpose of RFID tags in IoT networks?	BTL-2	Understand	CO2
18	Explain the significance of IoT data protocols in cloud communication.	BTL-2	Understand	CO2
19	What are the key components of the Zigbee protocol?	BTL-2	Understand	CO2
20	What is the primary difference between the security concerns in traditional networks and IoT networks?	BTL-2	Understand	CO2

UNIT II PART – B

Q. No	Questions	Mark	BT Level	Competence	Course Outcome
1	Explain the importance of protocol standardization for IoT. Discuss the challenges and efforts involved in achieving standardization across IoT networks.	16	BTL-3	Apply	CO2
2	Discuss the role of M2M communication in IoT, including its protocols and how it enables seamless device communication.	16	BTL-3	Apply	CO2
3	Describe the architecture of Wireless Sensor Networks (WSNs). How do WSN protocols enable communication in IoT environments?	16	BTL-3	Apply	CO2
4	Analyze the SCADA system and its integration with IoT. How does IoT improve the functionality and efficiency of SCADA systems?	16	BTL-3	Apply	CO2
5	Discuss the significance of RFID protocols in IoT. How do RFID devices interact with IoT systems for tracking and automation?	16	BTL-3	Apply	CO2
6	What are the main issues faced with IoT standardization? How do these challenges affect the scalability and interoperability of IoT systems?	16	BTL-3	Apply	CO2
7	Describe the importance of Unified Data Standards in IoT. How do they ensure seamless communication across diverse IoT devices?	16	BTL-3	Apply	CO2
8	Explain the IEEE 802.15.4 protocol and its role in low-power IoT applications. Discuss its advantages and limitations.	16	BTL-3	Apply	CO2
9	What is the BACnet protocol, and how does it support building automation systems in the context of IoT?	16	BTL-4	Analyze	CO2
10	Elaborate on the Modbus protocol. Discuss how it is used in industrial IoT applications for communication between devices and control systems.	16	BTL-4	Analyze	CO2
11	Discuss the KNX protocol used in smart homes and buildings. How does it facilitate device communication and automation in IoT systems?	16	BTL-4	Analyze	CO2
12	What is Zigbee, and how is it different from other wireless communication protocols like Wi-Fi and Bluetooth in IoT? Discuss its advantages and use cases.	16	BTL-4	Analyze	CO2
13	Discuss the architecture of the Network Layer in IoT. How does it handle routing and data transmission between devices?	16	BTL-4	Analyze	CO2
14	Explain the function and importance of the APS (Application Support Sub-layer) in IoT. How does it support the application layer in communication protocols?	16	BTL-5	Evaluate	CO2
15	How does security factor into IoT protocol standardization? Discuss the security risks and best practices for securing IoT communication protocols.	16	BTL-5	Evaluate	CO2
16	Discuss the protocols involved in connecting IoT systems to cloud platforms. How do these protocols handle large-scale data management and analysis?	16	BTL-6	Create	CO2
17	Explain the role of the Zigbee protocol in IoT networks. Discuss its stack architecture, applications, and its importance in low-power, low-bandwidth communication.	16	BTL-6	Create	CO2
18	Describe the integration of RFID with IoT. How does RFID enable automated tracking and management of resources in IoT systems?	16	BTL-6	Create	CO2

UNIT – III IOT PHYSICAL DEVICES AND ENDPOINTS

Introduction to Arduino and Raspberry Pi - Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry Pi with focus on interfacing external gadgets, controlling output, and reading input from pins.

Q. No	Questions	BT Level	Competence	Course Outcome
UNIT III PART – A				
1	What is Arduino, and what is its primary use in electronics?	BTL-1	Remember	CO3
2	What is Raspberry Pi, and how is it different from Arduino?	BTL-1	Remember	CO3
3	How do you install the Arduino IDE on your computer?	BTL-1	Remember	CO3
4	What are the key differences between Raspberry Pi and Arduino in terms of hardware?	BTL-1	Remember	CO3
5	What is SPI (Serial Peripheral Interface), and how is it used in Arduino and Raspberry Pi?	BTL-1	Remember	CO3
6	Explain I2C (Inter-Integrated Circuit) protocol and its application in Arduino.	BTL-1	Remember	CO3
7	What is the purpose of a serial interface in microcontrollers?	BTL-1	Remember	CO3
8	How do you connect an external LED to an Arduino board?	BTL-1	Remember	CO3
9	What is the role of the GPIO (General Purpose Input/Output) pins on the Raspberry Pi?	BTL-2	Understand	CO3
10	What is the use of the Serial.begin() function in Arduino?	BTL-2	Understand	CO3
11	How do you interface a temperature sensor with Raspberry Pi?	BTL-1	Remember	CO3
12	Explain the concept of PWM (Pulse Width Modulation) and how it is used in Arduino.	BTL-1	Remember	CO3
13	What is the digitalWrite() function in Arduino?	BTL-1	Remember	CO3
14	How does the Raspberry Pi handle analog signals since it lacks built-in analog-to-digital converters (ADC)?	BTL-2	Understand	CO3
15	What are the advantages of using Python for programming the Raspberry Pi?	BTL-2	Understand	CO3
16	What is the gpiozero library used for in Raspberry Pi programming?	BTL-2	Understand	CO3
17	How do you read an analog signal on an Arduino?	BTL-2	Understand	CO3
18	What is the purpose of I2C in Raspberry Pi, and which devices typically use it?	BTL-2	Understand	CO3
19	Explain the function of the input() method in a Python program.	BTL-2	Understand	CO3
20	What is the role of a pull-up resistor in a circuit with digital input on the Raspberry Pi or Arduino?	BTL-1	Remember	CO3

UNIT III PART – B

Q. No	Questions	Mark	BT Level	Competence	Course Outcome
1	Explain the difference between Arduino and Raspberry Pi in terms of hardware architecture, capabilities, and applications.	16	BTL-3	Apply	CO3
2	Describe the step-by-step process to install the Arduino IDE and set up the Arduino board for the first time.	16	BTL-3	Apply	CO3
3	Explain the Serial Communication Interface in detail. How do you set up a serial connection between Arduino and a PC?	16	BTL-3	Apply	CO3

4	Describe how to use SPI (Serial Peripheral Interface) to interface external sensors with Arduino. Include an example of using a temperature sensor.	16	BTL-3	Apply	CO3
5	Discuss the I2C protocol and demonstrate how to interface an I2C device (like a temperature sensor) with Arduino.	16	BTL-3	Apply	CO3
6	Explain the procedure to connect Raspberry Pi to an external device using the GPIO pins. Provide examples of controlling an LED and reading a button input.	16	BTL-4	Analyze	CO3
7	Discuss the GPIO pins of the Raspberry Pi and their role in interacting with external devices. How can you programmatically control these pins using Python?	16	BTL-4	Analyze	CO3
8	Write a Python program for the Raspberry Pi to control an LED connected to a GPIO pin. Include details on setup, coding, and running the program.	16	BTL-5	Evaluate	CO3
9	How do you read input from a sensor using the Raspberry Pi? Provide an example of using an ultrasonic distance sensor with the Pi.	16	BTL-6	Create	CO3
10	What are the key programming concepts required for controlling outputs (like motors or LEDs) and reading inputs (like sensors) on Arduino? Provide examples.	16	BTL-3	Apply	CO3
11	Discuss how you can use PWM (Pulse Width Modulation) on Arduino to control the brightness of an LED or the speed of a motor. Provide a sample code.	16	BTL-3	Apply	CO3
12	Explain the concept of interfacing external gadgets with Raspberry Pi via I2C. Provide an example of using an I2C LCD display with the Raspberry Pi.	16	BTL-3	Apply	CO3
13	Explain the Python programming environment on Raspberry Pi. Discuss setting up a Python environment, using libraries like RPI.GPIO , and writing Python code for GPIO control.	16	BTL-4	Analyze	CO3
14	Discuss the key differences between digital and analog inputs on Arduino. How do you interface an analog sensor (e.g., a potentiometer) with Arduino?	16	BTL-4	Analyze	CO3
15	Write a Python program for Raspberry Pi to read the value from a sensor (like a temperature sensor) and display the result on a screen.	16	BTL-4	Apply	CO3
16	Discuss the concept of multi-threading in Python for Raspberry Pi and how you can use it to handle multiple tasks like reading inputs and controlling outputs simultaneously.	16	BTL-5	Evaluate	CO3
17	How do you interface a motor driver with Raspberry Pi or Arduino to control a DC motor? Discuss wiring, programming, and control mechanisms.	16	BTL-6	Create	CO3
18	Discuss the security considerations and best practices when interfacing Raspberry Pi with external gadgets and devices. How can you secure your Raspberry Pi projects?	16	BTL-6	Create	CO3

UNIT – IV INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7

Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

Q. No	Questions	BT Level	Competence	Course Outcome
UNIT IV PART – A				
1	What is IoT Governance, and why is it important in the context of Smart Cities?	BTL-1	Remember	CO4
2	Define privacy in the context of IoT and Smart Cities.	BTL-1	Remember	CO4
3	What are the key security challenges in IoT for Smart Cities?	BTL-1	Remember	CO4
4	Explain the role of governance in managing IoT infrastructure in Smart Cities.	BTL-1	Remember	CO4
5	What is the FP7 program, and how did it contribute to IoT security?	BTL-1	Remember	CO4
6	How does IoT data impact privacy in Smart Cities?	BTL-1	Remember	CO4
7	What is the role of trust in IoT applications in Smart Cities?	BTL-1	Remember	CO4
8	What is data aggregation in the context of IoT for Smart Cities?	BTL-1	Remember	CO4
9	What is a secure platform for IoT, and why is it essential for Smart Cities?	BTL-1	Remember	CO4
10	What are the first steps towards building a secure platform for IoT in Smart Cities?	BTL-1	Remember	CO4
11	What is the Smartie approach to IoT security and privacy in Smart Cities?	BTL-1	Remember	CO4
12	What does data privacy mean in the context of IoT-driven Smart Cities?	BTL-1	Remember	CO4
13	What is the concept of data platforms for IoT in Smart Cities?	BTL-1	Remember	CO4
14	Why is security a major concern in IoT-enabled Smart City platforms?	BTL-2	Understand	CO4
15	What is the role of encryption in securing IoT data in Smart Cities?	BTL-2	Understand	CO4
16	How does GDPR affect IoT privacy and governance in Smart Cities?	BTL-2	Understand	CO4
17	Explain the term "data aggregation" and its role in Smart Cities.	BTL-2	Understand	CO4
18	What is the significance of IoT security standards in Smart Cities?	BTL-2	Understand	CO4
19	How can IoT devices be secured against cyberattacks in a Smart City environment?	BTL-2	Understand	CO4
20	What are the key elements of trust in IoT platforms for Smart Cities?	BTL-2	Understand	CO4

UNIT IV PART – B					
Q. No	Questions	Mark	BT Level	Competence	Course Outcome
1	Discuss the importance of governance in IoT, particularly in the context of Smart Cities. How does governance address privacy, security, and data management issues?	16	BTL-3	Apply	CO4
2	Explain the major privacy concerns in IoT and how they impact Smart City applications. What steps can be taken to mitigate these concerns?	16	BTL-3	Apply	CO4
3	How does security play a role in ensuring the effective operation of IoT systems in Smart Cities? Discuss the challenges faced and the possible solutions.	16	BTL-3	Apply	CO4
4	Describe the contributions of FP7 projects to the development of security and privacy solutions for IoT in Smart Cities.	16	BTL-3	Apply	CO4
5	Explain the concept of privacy and trust in IoT-driven data platforms for	16	BTL-3	Apply	CO4

	Smart Cities. How do privacy and trust affect user adoption and the overall success of these platforms?				
6	Discuss the key security protocols and measures necessary for securing IoT devices in Smart Cities. Provide examples of best practices.	16	BTL-3	Apply	CO4
7	What is the Smartie approach to IoT in Smart Cities? How does this approach help to address security, privacy, and trust issues in IoT platforms?	16	BTL-3	Apply	CO4
8	Explain the role of data aggregation in IoT systems for Smart Cities. How can data aggregation improve efficiency, and what are the associated security concerns?	16	BTL-3	Apply	CO4
9	Discuss the first steps towards building a secure IoT platform for Smart Cities. What architectural considerations should be taken into account to ensure security and privacy?	16	BTL-4	Analyze	CO4
10	What are the primary security and privacy risks in IoT data platforms for Smart Cities, and how can these risks be mitigated through governance?	16	BTL-4	Analyze	CO4
11	Explain how data platforms for Smart Cities can handle data privacy concerns while ensuring smooth data aggregation and processing.	16	BTL-4	Analyze	CO4
12	What are the challenges of managing large volumes of data in IoT-driven Smart Cities? Discuss solutions for data aggregation and analysis while maintaining privacy and security.	16	BTL-4	Analyze	CO4
13	How does the implementation of encryption and secure data protocols affect the governance of IoT systems in Smart Cities?	16	BTL-4	Apply	CO4
14	Describe how IoT platforms in Smart Cities can balance the need for data aggregation with the protection of sensitive personal information.	16	BTL-5	Evaluate	CO4
15	Discuss the role of trust and transparency in Smart City IoT systems. How can IoT platforms earn and maintain user trust while ensuring data security and privacy?	16	BTL-5	Evaluate	CO4
16	What role does the Internet of Things (IoT) play in the governance of Smart Cities? Discuss how IoT can be used for data-driven decision-making while addressing governance, privacy, and security challenges.	16	BTL-6	Create	CO4
17	How can Smart Cities ensure compliance with data protection regulations (e.g., GDPR) while still allowing IoT data collection and analysis?	16	BTL-6	Create	CO4
18	Discuss the future of IoT in Smart Cities, focusing on the integration of security, privacy, and governance frameworks. How do emerging technologies like AI and blockchain contribute to solving IoT challenges in Smart Cities?	16	BTL-4	Analyze	CO4

UNIT – V APPLICATIONS				
IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra				
Q. No	Questions	BT Level	Competence	Course Outcome
UNIT V PART – A				
1	What is the concept of a "Future Factory" in IoT applications?	BTL-1	Remember	CO5

2	What is Brownfield IoT, and how does it differ from Greenfield IoT?	BTL-1	Remember	CO5
3	Define the term "Smart Objects" in the context of IoT.	BTL-1	Remember	CO5
4	What is the role of IoT in industrial automation?	BTL-1	Remember	CO5
5	Explain the term "Smart Applications" in the IoT ecosystem.	BTL-1	Remember	CO5
6	What are the main advantages of integrating IoT into existing industrial systems (Brownfield IoT)?	BTL-1	Remember	CO5
7	What is IoT-A (IoT Architecture) and what are its key features?	BTL-1	Remember	CO5
8	How does the Hydra platform support the development of IoT applications?	BTL-1	Remember	CO5
9	What are the primary challenges of implementing Brownfield IoT in industries?	BTL-1	Remember	CO5
10	What is the significance of middleware in IoT systems?	BTL-1	Remember	CO5
11	How do smart sensors contribute to IoT applications in industries?	BTL-1	Remember	CO5
12	What role does data analytics play in industrial IoT applications?	BTL-1	Remember	CO5
13	What are the components of an IoT platform?	BTL-1	Remember	CO5
14	How does the IoT-A reference architecture benefit the development of IoT solutions?	BTL-2	Understand	CO5
15	What are the key features of IoT middleware in industrial settings?	BTL-2	Understand	CO5
16	How can IoT improve supply chain management in industries?	BTL-2	Understand	CO5
17	What are some common IoT protocols used in industrial IoT (IIoT) applications?	BTL-2	Understand	CO5
18	How does IoT contribute to energy efficiency in industrial applications?	BTL-2	Understand	CO5
19	What is the role of cloud computing in industrial IoT?	BTL-2	Understand	CO5
20	Explain the concept of real-time monitoring in IoT-enabled smart factories.	BTL-2	Understand	CO5

UNIT V PART – B

Q. No	Questions	Mark	BT Level	Competence	Course Outcome
1	Discuss the concept of Future Factory in IoT applications. How does IoT enable smart manufacturing processes, and what are its benefits for industries?	16	BTL-3	Apply	CO5
2	Explain the differences between Brownfield IoT and Greenfield IoT. How do industries transition from Brownfield to Greenfield IoT applications?	16	BTL-3	Apply	CO5
3	What are Smart Objects in IoT? Discuss their role in industrial IoT applications, and provide examples of how they are used in real-world scenarios.	16	BTL-3	Apply	CO5
4	Explain how Smart Applications leverage IoT technologies in industries. Discuss specific use cases, such as predictive maintenance and smart inventory management.	16	BTL-3	Apply	CO5
5	Provide an overview of IoT-A (IoT Architecture). What are its components, and how does it help in the design and deployment of IoT solutions?	16	BTL-3	Apply	CO5
6	Describe the Hydra platform for IoT development. How does it facilitate the creation of scalable and interoperable IoT applications, and what makes it suitable for industrial IoT (IIoT) environments?	16	BTL-3	Apply	CO5
7	How does the integration of IoT middleware simplify the development of IoT applications in industrial environments? Discuss key IoT middleware platforms and their features.	16	BTL-3	Apply	CO5
8	Discuss the challenges and solutions involved in integrating Brownfield	16	BTL-3	Apply	CO5

	IoT systems into existing industrial environments. What technologies and strategies are required for successful implementation?				
9	Explain how IoT can enhance predictive maintenance in factories. What sensors and IoT technologies are used for condition monitoring and failure prediction?	16	BTL-4	Analyze	CO5
10	Discuss the role of data analytics in IoT-based industrial applications. How does big data analytics help optimize production lines, reduce downtime, and improve overall efficiency in industries?	16	BTL-4	Analyze	CO5
11	Explain how IoT-enabled smart factories can improve supply chain management. Discuss how IoT technologies like RFID, GPS, and real-time tracking can streamline logistics.	16	BTL-4	Analyze	CO5
12	Describe how IoT middleware handles device management, data integration, and communication protocols in industrial IoT applications. Provide examples of popular IoT middleware platforms.	16	BTL-4	Analyze	CO5
13	What are the security concerns in IoT applications for industry? Discuss how IoT security can be addressed, focusing on device authentication, encryption, and network security in industrial environments.	16	BTL-4	Analyze	CO5
14	What is the role of cloud computing in IoT applications for industries? How do cloud platforms support scalability, data storage, and analytics in IoT-enabled manufacturing?	16	BTL-5	Evaluate	CO5
15	Discuss how IoT can contribute to energy management and efficiency in industries. Provide examples of IoT-based solutions for monitoring energy usage and reducing waste.	16	BTL-5	Evaluate	CO5
16	Explain the role of IoT in improving real-time decision-making in manufacturing environments. How do IoT sensors and data analytics enable real-time monitoring of production processes?	16	BTL-6	Create	CO5
17	Discuss the impact of IoT on quality control in manufacturing. How can IoT systems help monitor product quality, detect defects, and ensure compliance with standards?	16	BTL-6	Create	CO5
18	Analyze the scalability and interoperability challenges in industrial IoT. How do platforms like IoT-A and Hydra address these challenges, and what benefits do they provide in large-scale industrial IoT deployments?	16	BTL-5	Evaluate	CO5