SRM VALLIAMMAI ENGINEERING COLLEGE
(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Common to Medical Electronics)

QUESTION BANK

VI SEMESTER

1908609 – INTERNET OF THINGS AND ITS APPLICATIONS

Regulation – 2019

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SUBJECT CODE & TITLE: 1908609 – INTERNET OF THINGS AND ITS APPLICATIONS

SEM / YEAR: VI / III

UNIT – I: FUNDAMENTALS OF IoT

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

PART – A

Q.No.	Questions	CO	BT Level	Competence
1	Compare two IoT architectures oneM2M and IoTWF.	CO1	BTL2	Understand
2	Interpret the responsibilities of IT and OT in the IoT reference model	CO1	BTL2	Understand
3	Point out the challenges faced by Internet of Things.	CO1	BTL2	Understand
4	Summarize the benefits of convergence of IT and OT as IoT.	CO1	BTL2	Understand
5	List the applications of IoT.	CO1	BTL1	Remember
6	Define Big data.	CO1	BTL2	Understand
7	Mention two examples where Big data is generated in IoT systems.	CO1	BTL1	Remember
8	Sketch the IoT Reference model.	CO1	BTL2	Understand
9	Define IoT.	CO1	BTL1	Remember
10	List the layers and sublayers of the functional stack of core IoT.	CO1	BTL1	Remember
11	Identify the hierarchy of Fog, Edge and Cloud.	CO1	BTL2	Understand
12	Distinguish the following: active and passive sensor	CO1	BTL2	Understand
13	Write the difference between Invasive and non-invasive sensor.	CO1	BTL2	Understand
14	Write the evolutionary phases of IoT.	CO1	BTL2	Understand
15	How do you classify sensors and actuators layers ?	CO1	BTL1	Remember
16	Summarize the purpose of Sensors, Actuators and Smart Objects.	CO1	BTL2	Understand

17	What is called IoT ecosystem? Name the functional blocks of it.	CO1	BTL1	Remember
18	Mention the defining characteristics of Fog Computing.	CO1	BTL2	Understand
19	Enumerate the types of sensors.	CO1	BTL2	Understand
20	Compare Fog and Edge computing.	CO1	BTL2	Understand
21	Illustrate how sensors and actuators interact with the physical world?	CO1	BTL2	Understand
22	Identify the communication criteria used for connecting smartobjects.	CO1	BTL2	Understand
23	Summarize the functionalities of collaboration and process layer of IoTWF model.	CO1	BTL2	Understand
24	Point out the trends in smart objects.	CO1	BTL1	Remember
	PART – B			
1	Describe the seven layers of IoT Reference model byIoTWF with necessary diagrams. (13)	CO1	BTL3	Apply
2	Illustrate each layer of the oneM2M IoT standardized architecture with neat diagram. (13)	CO1	BTL3	Apply
3	(i)Analyze the IoT Challenges in detail. (9) (ii)Illustrate about the trends in smart objects that are impacting IoT (4)	CO1	BTL4	Analyze
4	(i)Summarize the evolutionary phases of the Internet. (10) (ii) Write a note on IoT and Digitization , (3)	CO1	BTL3	Apply
5	(i) Categorize the Alternative IoT Reference Models. (6) (ii) Describe the simplified IoT Architecture. (7)	CO1	BTL3	Apply
6	Draw and explain the expanded view of simplified IoT architecture with necessary diagrams. (13)	CO1	BTL3	Apply
7	(i)Examine about components of Core IoT functional stack (8) (ii) Write the example of sensor applications based on mobility and throughput. (5)	CO1	BTL4	Analyze
8	(i)Describe the architectural classification of 'Things' or 'smart objects' in core IoT functional stack with diagrams . (7) (ii) Write short notes on access technologies used in IoT. (6)	CO1	BTL3	Apply
9	Analyze the following functions of applications and analytics layer of IoT network. (i) Analytics versus Control applications (4) (ii) Data Versus Network analytics (4) (iii) Data analytics Versus Business benefits (5)	CO1	BTL4	Analyze
10	(i)Summarize the smart services offered by applications and analytics layer of IoT. (7) (ii)Summarize the responsibilities of IT and OT in the IoT reference model. (6)	CO1	BTL3	Apply
11	Draw the layered structure of IoT data management and compute stack with fog layer. Justify why fog layer is introduced in it. Also comment about Edge computing (13)	CO1	BTL3	Apply
12	Analyze in detail the hierarchy followed in Edge, Fog and Cloud with suitable illustration. (13)	CO1	BTL4	Analyze
13	Explain in detail about actuators and Micro Electro Mechanical Systems. (13)	CO1	BTL4	Analyze
14	List out and explain the communication criteria that must be considered in connecting smart objects (13)	CO1	BTL3	Apply

15	(i)Examine the different ways of categorizing sensors with necessary explanation (7) (ii)Give examples for any six types of sensors and relate its name with its principle of operation. (6)	CO1	BTL4	Analyze
16	Describe in detail about M2M ecosystem with necessary diagram. (13)	CO1	BTL4	Analyze
17	(i)Explain in detail about the sensors used in a smart phone with necessary diagram. (10) (ii) Write a note on biodegradable sensors for smart farming. (3)	CO1	BTL3	Apply
PART – C				
1	Explain in detail about the two architectures supported by OneM2M and IoTWF with necessary diagrams. (15)	CO1	BTL4	Analyze
2	Identify the need for incorporation of Fog and Edge layers into the traditional Cloud computing model and explain how the requirements are satisfied by these layers. (15)	CO1	BTL3	Apply
3	Elaborate in detail about the technologies for connecting smart objects and identify the communication criteria for IoT applications. (15)	CO1	BTL4	Analyze
4	Describe in detail about the characteristics of smart objects and mention the trends impacting IoT in detail. (15)	CO1	BTL3	Apply
5.	(i)Create a scenario to illustrate the applications of IoT by means of connected cars and explain . (9) (ii)Mention the challenges addressed by the connected roadways in IoT (6)	CO1	BTL4	Analyze

UNIT - II: IoT PROTOCOLS

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo,Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

PART – A

Q.No.	Questions	CO	BT Level	Competence
1	Name the types of deployments of IEEE 802.15.4 standard.	CO2	BTL1	Remember
2	Write the relationship between IEEE 1901.2a and NB-PLC.	CO2	BTL2	Understand
3	Draw the high level ZigBee Protocol stack.	CO2	BTL1	Remember
4	List the topologies supported by IEEE 802.15.4 standard.	CO2	BTL1	Remember
5	Compare ZigBee and ZigBee IP.	CO2	BTL2	Understand
6	Identify the applications of IEEE1901.2a.	CO2	BTL2	Understand
7	Sketch the MAC Layer Security frame format of IEEE 802.15.4g/e.	CO2	BTL1	Remember
8	Mention the significance of IEEE 802.15.4 standard.	CO2	BTL2	Understand
9	Define the medium access methods used in IEEE 802.15.4 standard.	CO2	BTL1	Remember

10	Identify the applications of ZigBee protocol.	CO2	BTL2	Understand
11	How does the data rate vary in LoRaWAN?.	CO2	BTL2	Understand
12	Point out the LoRaWAN layers.	CO2	BTL2	Understand
13	What are the protocols used for optimizing IP for IoT.	CO2	BTL1	Remember
14	Write about the concept of constrained nodes and constrained networks.	CO2	BTL2	Understand
15	What is an acronym of 6LoWPAN? and explain.	CO2	BTL1	Remember
16	Outline the features of 6LoWPAN.	CO2	BTL2	Understand
17	Differentiate 6LoWPAN from 6Lo.	CO2	BTL2	Understand
18	List the scheduling management mechanism in 6TiSCH.	CO2	BTL2	Understand
19	Why the protocol translation of SCADA is needed in IoT protocols.	CO2	BTL1	Remember
20	Classify the IoT Application Transport methods.	CO2	BTL2	Understand
21	Name the three level of QoS supported by MQTT.	CO2	BTL1	Remember
22	Identify the protocol used for resource-oriented applications in constrained networks.	CO2	BTL2	Understand
23	Mention the features of CoAP.	CO2	BTL2	Understand
24	Sketch the high level IoT protocol stack for CoAP and MQTT.	CO2	BTL2	Understand
	PART – B			
1	Illustrate the security header format of IEEE 802.15.4g/e and also specify the improvements in physical and MAC layers for IoT use cases. (13)	CO2	BTL3	Apply
2	Analyze the following access technologies with connectivity over IoT networks (i) IEEE 802.11g (6) (ii) IEEE 802.11ah (7)	CO2	BTL4	Analyze
3	(i) Draw and explain the MAC frame format of IEEE 802.15.4. (10) (ii) List the types of topology used in IEEE 802.15.4 protocol. (3)	CO2	BTL3	Apply
4	Explain in detail about ZigBee protocol with necessary diagrams. (13)	CO2	BTL3	Apply
5	Describe in detail about the protocol stacks utilizing IEEE 802.15.4 with necessary applications. (13)	CO2	BTL3	Apply
6	Describe about LoRaWAN architecture with necessary diagrams. (13)	CO2	BTL3	Apply
7	Compare and contrast the physical and MAC layers of IoT Access technologies with suitable illustrations. (13)	CO2	BTL4	Analyze
8	Explain the following: (i) LoRaWAN security (6) (ii) Narrowband Power line communication (7)	CO2	BTL3	Apply
9	Examine the role of wired access protocol IEEE1901.2a workinggroup in connecting smart objects. (13)	CO2	BTL4	Analyze
10	(i) Compare the characteristics of 6LoWPAN Protocol stack using adaptation layer with standard IP Protocol stack. (10)	CO2	BTL3	Apply

	(ii) Mention the need for Optimizing IP for IoT using adaptation layer. (3)			
11	(i) Differentiate 6LoWPAN working group from 6Lo working group.(6) (ii) Write a detailed notes on RPL network (7)	CO2	BTL3	Apply
12	Categorize the IoT Application Transport Methods and explain in detail about Supervisory Control and Data Acquisition. (13)	CO2	BTL3	Apply
13	(i) Describe in detail about protocol stack for transporting serial DNP3 SCADA over IP. (8) (ii) Write the difference between CoAP and MQTT. (5)	CO2	BTL3	Apply
14	Write short notes on (i) IoT constrained nodes (7) (ii) IoT constrained networks (6)	CO2	BTL3	Apply
15	Describe about Application Layer Protocols: (i) CoAP (7) (ii) MQTT (6)	CO2	BTL4	Analyze
16	Analyze the main characteristics of Constrained Application Protocol and Message Queuing Telemetry Transport Application Layer Protocols with necessary illustrations . (13)	CO2	BTL4	Analyze
17	Examine how the routing solution is achieved through Routing over Low Power and Lossy Networks with suitable diagrams. (13)	CO2	BTL3	Apply
PART – C				
1	List the functions of web based IoT application layer protocols for constrained networks. Also explain about MQTT publish/subscribe framework based on the TCP/IP architecture. (15)	CO2	BTL3	Apply
2	Develop the IETF working group 6LoWPAN and its successor 6Lo to optimize the transmission of IPv6 packets over constrained networks. (15)	CO2	BTL3	Apply
3	Examine the amendments of IEEE 802.15.4 specification such as IEEE 802.15.4g and IEEE 802.15.4e, IEEE 802.11ah, LoRaWAN for IoT applications. (15)	CO2	BTL4	Analyze
4	Analyze in detail how the wireless access technology IEEE 802.15.4 adapts for low cost and low data rate devices and also to address a wide range of IoT use cases. (15)	CO2	BTL4	Analyze
5	Explain in detail with respect to MQTT message format and their QoS flows with necessary diagrams. (15)	CO2	BTL3	Apply

UNIT - III: DESIGN AND DEVELOPMENT				
Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming				
PART – A				
Q.No.	**Questions**	**CO**	**BT Level**	**Competence**
1	Name the building blocks of the IoT system.	CO3	BTL1	Remember
2	Mention the different modules of IoT SoC	CO3	BTL2	Understand
3	Mention the benefits of SoC.	CO3	BTL2	Understand
4	What are the steps involved in IoT Design methodology?	CO3	BTL1	Remember

5	List the interfaces of Raspberry Pi.	CO3	BTL1	Remember
6	Write the major layers of IoT architecture.	CO3	BTL2	Understand
7	Point out the services supported by Management Service Layer.	CO3	BTL2	Understand
8	Compare sensors and actuators.	CO3	BTL2	Understand
9	Draw the process specification of home automation system.	CO3	BTL1	Remember
10	Identify the role of Embedded computing in building IoT projects.	CO3	BTL2	Understand
11	Point out the use and purpose of Arduino in building IoT solutions	CO3	BTL2	Understand
12	Justify how Raspberry Pi is different from a desktop computer	CO3	BTL2	Understand
13	What is the use of GPIO pins in a IoT device?	CO3	BTL1	Remember
14	List out various versions of raspberry pi devices till date.	CO3	BTL2	Understand
15	Name the different IoT platforms	CO3	BTL1	Remember
16	Analyze how programming raspberry pi works.	CO3	BTL2	Understand
17	Enumerate the various components of Raspberry Pi Processor.	CO3	BTL2	Understand
18	Summarize on the need of microcontroller in embedded system.	CO3	BTL2	Understand
19	Write a python program to turn the LED ON/OFF with Raspberry Pi.	CO3	BTL2	Understand
20	How the sensors and actuators are programmed with Raspberry Pi processor?	CO3	BTL2	Understand
21	Categorize any five commands on Rasperry pi with its functions.	CO3	BTL2	Understand
22	Differentiate Raspberry with Arduino	CO3	BTL2	Understand
23	Outline the characteristics of Python programming language.	CO3	BTL2	Understand
24	List the essential requirements for setting up Raspberry Pi.	CO3	BTL1	Remember
PART – B				
1	(i) List the IoT design methodology with necessary illustrations . (6) (ii) Examine the building blocks of IoT. (7)	CO3	BTL3	Apply
2	Describe in detail the use of embedded computing in the design of IoT Sysems (13)	CO3	BTL3	Apply
3	(i) Summarize in detail about embedded computing. (6) (ii) Explain the microcontroller and chips involved in embeddeddevices. (7)	CO3	BTL3	Apply
4	Explain the key steps involved in IoT Design methodology with diagrams. (13)	CO3	BTL4	Analyze
5	Elaborate on python programming for Raspberry Pi with necessary diagrams. (13)	CO3	BTL4	Analyze
6	(i) Analyze in detail an Exemplary device: Raspberry Pi. (6) (ii) Explain in detail the Raspberry Pi interfaces. (7)	CO3	BTL4	Analyze
7	Illustrate the Arduino board details and explain the steps for installing the board. (13)	CO3	BTL3	Apply

8	Examine in detail the building blocks of IoT and its functionalities with suitable illustration. (13)	CO3	BTL3	Apply
9	Describe the steps for designing IoT system with neat diagram. (13)	CO3	BTL3	Apply
10	(i) Examine the process of using the Integrated Development Environment (IDE) to prepare an Arduino sketch. (7) (ii) Describe the steps for setting up of Arduino board. (6)	CO3	BTL4	Analyze
11	Write short notes on the following: (i) Commands and its function on Raspberry Pi. (8) (ii) Raspberry Pi Interfaces. (5)	CO3	BTL3	Apply
12	Explain the following for home automation system: (i) Process Specification (6) (ii) Information model specification (7)	CO3	BTL3	Apply
13	Define IoT device and sketch a detailed diagram of IoT device with an example in real world applications. (13)	CO3	BTL3	Apply
14	Write the procedure to model an Interfacing LED and switch with Raspberry Pi with diagrams . (13)	CO3	BTL3	Apply
15	Illustrate with necessary diagrams the software and hardware features of Arduino board andexplain the procedure to install IDE. (13)	CO3	BTL4	Analyze
16	Analyze the embedded computing logic and use of microcontroller in embedded system with neat diagram. (13)	CO3	BTL4	Analyze
17	With necessary diagrams explain the various components and peripherals of Raspberry Pi processor. (13)	CO3	BTL3	Apply
PART – C				
1	(i) Describe the services derived from process specification and information model for Home Automation IoT system. (10) (ii) Draw and explain the Deployment design of the home automation IoT system. (5)	CO3	BTL3	Apply
2	Examine some examples that define IoT devices and explain in brief the basic building block and layers in IoT system with diagram. (15)	CO3	BTL3	Apply
3	Analyze in detail the design methodology used to implement IoT Devices, explain the level wise design steps with neat diagram. (15)	CO3	BTL4	Analyze
4	Analyze and explain in detail Programming Raspberry Pi with python by giving suitable example. Also elaborate on Raspberry Pi interfaces. (15)	CO3	BTL4	Analyze
5	Design a basic Arduino board and explain the procedure for installing and setting up of IDE. (15)	CO3	BTL3	Apply

UNIT- IV : DATA ANALYTICS AND SUPPORTING SERVICES

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework –Django – AWS for IoT – System Management with NETCONF-YANG

PART – A

Q.No.	Questions	CO	BT Level	Competence
1	Compare the two categories of machine learning.	CO4	BTL2	Understand
2	Write the major four domains of applications of ML for IoT.	CO4	BTL2	Understand
3	Define Neural networks.	CO4	BTL1	Remember

4	Identify the need of data analytics for IoT.	CO4	BTL2	Understand
5	Mention the use of AWS in IoT.	CO4	BTL1	Remember
6	Define Machine Learning.	CO4	BTL1	Remember
7	Compare Data in motion vs Data at Rest.	CO4	BTL2	Understand
8	List the challenges in IoT data analytics.	CO4	BTL2	Understand
9	Sketch the edge analytics processing unit.	CO4	BTL2	Understand
10	Point out the use of NoSQL Database.	CO4	BTL2	Understand
11	Outline on Hadoop.	CO4	BTL2	Understand
12	Differentiate between Supervised vs Unsupervised learning with examples.	CO4	BTL2	Understand
13	Write a note on Hadoop ecosystem.	CO4	BTL2	Understand
14	Write the benefits of flow analytics.	CO4	BTL2	Understand
15	Summarize on Edge streaming analytics.	CO4	BTL2	Understand
16	Define YARN.	CO4	BTL1	Remember
17	Name the core functions of Edge Analytics.	CO4	BTL1	Remember
18	Outline the stages of data processing in an edge APU.	CO4	BTL2	Understand
19	Examine the role of Python Web application framework – Django.	CO4	BTL2	Understand
20	Write the features of Apache spark.	CO4	BTL2	Understand
21	Point out the features of Apache Kafka.	CO4	BTL2	Understand
22	Compare Big Data and Edge Analytics.	CO4	BTL2	Understand
23	Define Amazon S3 and Amazon RDS.	CO4	BTL1	Remember
24	Identify the role of various components of NETCONF-YANG.	CO4	BTL1	Remember
PART – B				
1	Explain in detail how neural networks are used to recognize a dog in a photo with necessary layers. (13)	CO4	BTL4	Analyze
2	Compare in detail about (i) Structured Vs Unstructured Data. (6) (ii) Data in Motion Vs Data in Rest. (7)	CO4	BTL3	Apply
3	Write in detail about: (i) Classification of Machine Learning in IoT. (6) (ii) Distributed analytics systems. (7)	CO4	BTL3	Apply
4	Explain in detail the need of Data Analytics for IoT and brief the Challenges faced by IoT Data Analytics. (13)	CO4	BTL4	Analyze
5	Describe in detail about Hadoop ecosystem and the two key components with suitable illustration. (13)	CO4	BTL3	Apply
6	Write a short note on the necessity of Apache Kafka and Apache Spark with diagram. (13)	CO4	BTL3	Apply

7	(i) Write in detail about the Edge streaming analytics and compare it with data analytics. (10) (ii) Mention the functions of Edge analytics. (3)	CO4	BTL2	Understand
8	Examine the need for Network Analytics and discuss on flexible Netflow Architecture. (13)	CO4	BTL4	Analyze
9	Describe in detail about Xively cloud for IT and Illustrate Xively dashboard device details. (13)	CO4	BTL4	Analyze
10	Examine the Python Web Application framework – Django architecture and steps to develop a django project. (13)	CO4	BTL3	Apply
11	Elaborate the purpose of Amazon Web service for IoT with necessary illustrations. (13)	CO4	BTL4	Analyze
12	Analyze the role of various components of NETCONF-YANG and steps for IoT device Management with NETCONF-YANG. (13)	CO4	BTL4	Analyze
13	Describe the key components of Hadoop ecosystem: HDFS and Mapreduce with necessary diagrams. (13)	CO4	BTL4	Analyze
14	Elaborate the use of (i) Python Web Application Framework – Django. (6) (ii) Flexible NetFlow architecture. (7)	CO4	BTL3	Apply
15	Write short notes on the following (i) NoSQL Databases (6) (ii) Distributed Hadoop Cluster (7)	CO4	BTL3	Apply
16	With necessary illustrations explain in details about Edge analytics core functions. (13)	CO4	BTL3	Apply
17	Examine on Edge streaming analytics and Data analytics of IoT. (13)	CO4	BTL4	Analyze
	PART – C			
1	Elaborate on the following for IoT applications: (i) Machine Learning and its classifications. (8) (ii) Machine Learning and getting intelligence from big data. (7)	CO4	BTL4	Analyze
2	Describe how a neural network recognizes an object in an image with an example. (15)	CO4	BTL3	Apply
3	Discuss in detail about network analytics with smart grid FAN analytics with NetFlow example. (15)	CO4	BTL4	Analyze
4	List and explain the purpose of Python Web Application Framework – Djangoand Amazon Web service for IoT. (15)	CO4	BTL3	Apply
5	Examine in detail about Apache spark and Apache kafka with data flow diagram. (15)	CO4	BTL4	Analyze

UNIT - V: CASE STUDIES

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plant wide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

PART – A

Q.No.	Questions	CO	BT Level	Competence
1	What are the uses of Fog Computing	CO5	BTL1	Remember
2	Brief the sub layers of security in IoT systems.	CO5	BTL1	Remember
3	List the six pillars/components of Cisco IoT Systems.	CO5	BTL1	Remember
4	Define Watson IoT Platform.	CO5	BTL1	Remember

5	Classify the key features of IBM Watson platform.	CO5	BTL2	Understand
6	Summarize the use of Watson Conversation services.	CO5	BTL2	Understand
7	Describe in brief Converged Plantwide Ethernet Model.	CO5	BTL1	Remember
8	Point out the use of blockchain services in IBM Watson IoT platform.	CO5	BTL2	Understand
9	Classify the implementation and design guidance of CPwE.	CO5	BTL2	Understand
10	Compose the three stages of power supply-chain in power utility industry.	CO5	BTL2	Understand
11	Outline about the use of smart traffic application.	CO5	BTL2	Understand
12	Infer how IoT data are Securely connected, managed and analysed.	CO5	BTL2	Understand
13	Summarize on GridBlocks reference model.	CO5	BTL2	Understand
14	Mention the challenges that become even more evident as the IT and OT networks become interconnected.	CO5	BTL1	Remember
15	Give the benefits provided by The GridBlocks reference architecture to utility operators.	CO5	BTL2	Understand
16	Interpret any one use case of smart applications of IoT.	CO5	BTL2	Understand
17	Explain about IoT Strategy for Smarter Cities.	CO5	BTL2	Understand
18	Express why LED technology is used in street lighting?	CO5	BTL2	Understand
19	Define connected manufacturing.	CO5	BTL1	Remember
20	Sketch the smart parking use case diagram.	CO5	BTL1	Remember
21	Categorize the common industry elements for security on the network layer.	CO5	BTL2	Understand
22	Identify the IoT technologies for roadways.	CO5	BTL2	Understand
23	State about DSRC	CO5	BTL1	Remember
24	Write about field area network (FAN).	CO5	BTL2	Understand
	PART – B			
1	Examine the features of Cisco IoT System and explain the components and security involved in it. (13)	CO5	BTL3	Apply
2	Analyze the purpose of the Six-Pillar Approach for Cisco IoT System also explain the security framework. (13)	CO5	BTL4	Analyze
3	Examine the Features of IBM Watson IoT platform, and brief on the services provided in it. (13)	CO5	BTL3	Apply
4	Analyze in detail the architecture of Converged Plantwide Ethernet Model with suitable illustration (13)	CO5	BTL4	Analyze
5	(i) Describe an IoT strategy for connected Manufacturing. (6) (ii) Examine the architecture for connected factory. (7)	CO5	BTL3	Apply
6	Elaborate the challenges faced for parking in cities, and explain how smart parking provides a solution with necessary explanations. (13)	CO5	BTL4	Analyze
7	(i) Mention the use of Power Utility Industry. (7) (ii) Examine the IT/OT divide in Utilities. (6)	CO5	BTL3	Apply

8	Illustrate the 11-Tiered Reference Architecture of Grid Blocks and the use of reference model. (13)	CO5	BTL3	Apply
9	(i) Summarize in detail the architecture model of CPwE. (7) (ii) Examine on design and implementation guidance of CPwE. (6)	CO5	BTL3	Apply
10	Summarize on the solution for smart lighting and explain street lighting architecture in detail. (13)	CO5	BTL3	Apply
11	(i) Generalize an IoT strategy for smart city. (6) (ii) Design an smart city layered architecture and explain howsecurity is provided. (7)	CO5	BTL3	Apply
12	Describe the architecture of smart traffic control architecture and explain the applications of smart traffic in detail . (13)	CO5	BTL3	Apply
13	Analyze the grid block reference model and the reference architecture with suitable illustration. (13)	CO5	BTL4	Analyze
14	(i) Examine any one use case example of smart city examples. (6) (ii) Describe the smart city security architecture. (7)	CO5	BTL4	Analyze
15	Explain in detail about connected lighting architecture with necessary diagrams. (13)	CO5	BTL3	Apply
16	Describe in detail about connected parking architecture with necessary diagrams. (13)	CO5	BTL4	Analyze
17	(i) Examine the function of DSRC general communication architecture. (8) (ii) Compare the features of DSRC to other protocols for connected roadways. (5)	CO5	BTL4	Analyze
PART – C				
1	Analyze the IoT platform designed by IBM Watson, explain what it can do to your business, and infer how IoT data are securely connected, managed and analyzed. (15)	CO5	BTL4	Analyze
2	Elaborate about IoT strategy for smart city and design the layered architecture for implementing smart citie (15)	CO5	BTL3	Apply
3	Describe in detail about FAN multiservice grid network with necessary diagram and state its key advantages. (15)	CO5	BTL3	Apply
4	Consider any use case example of smart applications of IoT, explain the architecture and technology need in building the application. (15)	CO5	BTL4	Analyze
5	List an Industrial application of IoT system and brief on the various use case of smart and connected cities. (15)	CO5	BTL3	Apply