503236	INTERNETOFTHINGS			L	T	P	C
				3	0	0	3
Programme:	B.E.(CSE)	**Sem:**	**VII**	**Category:**			**ES**
Prerequisite:	Internet of Things						
Aim:	Toenablethestudentstocreateaknowledgeabout IoT.						

CourseObjectives:	
1	Tolearn fundamentalsofInternetofThings
2	ToknowaboutthevariousM2M communications
3	Tounderstand theM2mVsIoTcharacteristics
4	TounderstandthedomainspecificcommunicationmodelsofIoT
5	Toelaboratethefuturedirection inIoTsolutions

CourseOutcomes: Thestudentswillbeableto:	
CO1:	Understand thefundamentalconceptsofInternet ofThings
CO2:	UnderstandtheconceptofM2Mcommunicationstointernetofthings
CO3:	Analyzethe conceptofM2mVsIoTcharacteristics
CO4:	Understandtheconceptsofdomainspecificcommunication modelsofIoT
CO5:	Developing theconcept ofIoTsolutions

COURSEOUTCOMESVSPROGRAMOUTCOMESMAPPING

CourseOutcomes	**ProgramOutcomes**												**Program SpecificOutcomes**	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	POS1	PSO2
CO1	2	2	1	2	1			3			2	1		2
CO2	1	1	2	2	2	2					2	2	2	
CO3	2	2	1	2	2			2			2	2		1
CO4	1	1	2	2	2	2						1		1
CO5	1	3	1		2		2	2				1		1

Entercorrelationlevels1, 2&3defineas:1-low,2- medium,&3-high

UNIT-I	**INTRODUCTION**	**Hrs**
IntroductiontoIoT:Sensing,Actuation-Networkingbasics-CommunicationProtocols- Sensor Networks- Machine-to-Machine Communications- IoTDefinition,Characteristics. IoT Functional Blocks, Physical design of IoT-Logical design of IoT-Communicationmodels&APIs		**9**
UNIT-II	**M2MTO IOT**	**Hrs**
The Vision-Introduction From M2M to IoT-M2M towards IoT-the global context-Ause case example-Differing Characteristics. Definitions-M2M Value Chains-IoTValueChains-AnemergingindustrialstructureforIoT		**9**

UNIT–III	M2MVSIOTANARCHITECTURALOVERVIEW	Hrs
M2MvsIoTAnArchitecturalOverview-Buildingarchitecture-Maindesignprinciplesandneededcapabilities-AnIoTarchitectureoutline-standardsconsiderations-ReferenceArchitectureandReferenceModelofIoT.		9
UNIT-IV	**DOMAINSPECIFIC APPLICATIONSOFIOT**	**Hrs**
DomainspecificapplicationsofIoT-Homeautomation-Industryapplications-SurveillanceApplications-OtherIoTapplication-FogComputing-ConnectedVehicles- Data Aggregation for the IoT in Smart Cities- Privacy and Security Issues inIoT.		9
UNIT–V	**DEVELOPINGIOTSOLUTIONS**	**Hrs**
DifferentIoTTools-DevelopingIoTSolutionforRealTimeApplicationsUsing:Arduino-RaspberryPi-CloudComputing		9

Total:45Periods

Textbook(s):

1. JanHoller,VlasiosTsiatsis,CatherineMulligan,StefanAvesand,StamatisKarnouskos,David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a NewAge ofIntelligence”,Academic Press,FirstEdition,2014.

Reference Book(s):

1.Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything”,ApressPublications,FirstEdition2013.
2.Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, VPT,FirstEdition,2014.

QUESTION BANK
UNIT-1

No.	Question	CO	BT Level
	UNIT – 1:INTRODUCTION TO IOT		
	PART-A(TwoMarksQuestions)		
1	**ListouttheFeaturesofIoT.** IoT has ten major features and they are- scalability, connectivity, Architecture, intelligence, security, dynamic or Self-Adapting nature, management, integration, analyzing, and compact nature of devices.	**CO1**	
2	**StatethecharacteristicsofIoT.** - Connectivity. Connectivity is an essential feature of IoT. ... - Identity of Things. The collaboration of name and number gives an identity to an internet device. ... - Intelligence. ... - Dynamic. ... - Scalability. ... - Self Upgradation. ... - Architecture. ... - Security.	**CO1**	
3	**ListouttheinterfacesusedinIoT?** An IoT device may consist of several interfaces for communication to other devices both wired and wireless. These includes (i) I/O interfaces for sensors, (ii) Interfaces for internet connectivity (iii) memory and storage interfaces and (iv) audio/video interfaces.	**CO1**	
4	**Definedataandinformation.** **Data:** data is information that has been translated into a form that is efficient for movement or processing. **Information:** Information is stimuli that have meaning in some context for its receiver. When information is entered into and stored in a computer, it is generally referred to as data.	**CO1**	
5	**BuildthephysicaldesignofIoT.** A physical design of an IoT system refers to the individual node devices and their protocols that are utilized to create a functional IoT ecosystem. Each node device can perform tasks such as remote sensing, actuating, monitoring, etc., by relying on physically connected devices.	**CO1**	
6	**DefineWirelessSensorNetworks.** **Wireless Sensor Network (WSN)** is an infrastructure-less wireless network that is deployed in a large number of wireless sensors in an ad-hoc manner that is used to monitor the system, physical or environmental conditions.	**CO1**	
7	**DeterminethebasicoperationsinIoT.**	**CO1**	

<table>
<tr><td></td><td>The basic process of how IoT works is as follows: A group of physical devices is wired or wirelessly linked to each other and/or a central area. The devices collect data from the external world using some kind of sensor.</td><td></td><td></td></tr>
<tr><td>8</td><td>ListoutvariousprotocolusedinApplicationlayer.
• Domain Name System. The Domain Name System (DNS) works on Client Server model.
• Simple Mail Transfer Protocol.
• File Transfer Protocol.
• Post Office Protocol (POP)
• Hyper Text Transfer Protocol (HTTP)</td><td>CO1</td><td></td></tr>
<tr><td>9</td><td>CompareTCPandUDP.</td><td>CO1</td><td></td></tr>
<tr><td>10</td><td>DiscussCloudcomputing.
Cloud computing is on-demand access, via the internet, to computing resources—applications, servers (physical servers and virtual servers), data storage, development tools, networking capabilities, and more—hosted at a remote data center managed by a cloud services provider (or CSP). The CSP makes these resources available for a monthly subscription fee or bills them according to usage.</td><td>CO1</td><td></td></tr>
<tr><td>11</td><td>DifferentiatebetweenLogicalandphysicaldesignofIoT.
<table>
<tr><th>Physical Design</th><th>Logical Design</th></tr>
<tr><td>Physical design is highly detailed.</td><td>Logical design is a high-level design and doesn’t provide any detail.</td></tr>
<tr><td>Physical design is more graphical than textual; however, it can comprise both.</td><td>Logical design can be textual, graphic, or both.</td></tr>
<tr><td>A physical design focuses on specific solutions explaining how they are assembled or configured.</td><td>A logical design focuses on satisfying the design factors, including risks, requirements, constraints, and assumptions.</td></tr>
</table></td><td>CO1</td><td></td></tr>
<tr><td>12</td><td>TabulatevariousprotocolsusedinLinklayerofIoT.
<table>
<tr><td>Bluetooth</td><td>Bluetooth is a PAN (Personal Area Network) or it is a short-range wireless communication network for exchanging data between the connected devices through that network</td></tr>
</table></td><td>CO1</td><td></td></tr>
</table>

	ZigBee	Zigbee is similar to Bluetooth technology with 2.4Ghz frequency. It is a low power personal communication network.		
	BLE (Bluetooth Low Energy)	Bluetooth Low Energy is also known as Bluetooth smart which is a wireless PAN(Personal Area Network).		
	Wi-Fi (Wireless Fidelity)	WiFi is a local area network which is a wireless network there is no wired connection. It is Proposed by Wi-Fi Alliance.		
	Z-Wave	Z-wave technology is a wireless communication protocol that creates a wireless Mesh network. It is based on low power RF(Radio Frequency) based technology.		
	Sigfox	Sigfox is a form of wireless communications that provides low power and long-range wireless connectivity for devices.		
13	**DefineIoT.** The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.		**CO1**	
14	**DefineActuators.** An actuator is a device that produces a motion by converting energy and signals going into the system. The motion it produces can be either rotary or linear. An actuator is a device that produces a motion by converting energy and signals going into the system. The motion it produces can be either rotary or linear.		**CO1**	
15	**DifferentiatebetweendataandinformationinIoT.**		**CO1**	

Data	**Information**
Data is unorganised and unrefined facts	Information comprises processed, organised data presented in a meaningful context
Data is an individual unit that contains raw materials which do not carry any specific meaning.	Information is a group of data that collectively carries a logical meaning.
Data doesn't depend on information.	Information depends on data.
Raw data alone is insufficient for decision making	Information is sufficient for decision making
An example of data is a student's test	The average score of a class is the information

	score derived from the given data.		
16	**RecalltheadvantagesdisadvantagesofIoT.** **Advantages** / **Disadvantages** 1. Improved Efficiency and Productivity / 1. Security Risks 2. Cost Savings / 2. Complexity 3. Enhanced Communication and Connectivity / 3. Compatibility Issues 4. Real-time Monitoring and Control / 4. Data Overload	**CO1**	
17	**ListouttheI/OinterfacesusedinIoT.** I/O interfaces are the mediums in which data are sent from internal logic to external sources and from which data are received from external sources. The interface signals can be unidirectional or bidirectional, single-ended or differential and could follow one of the different I/O standards.	**CO1**	
18	**ShowtheprotocolsusedinTransportlayerofIoT.** The transport layer is the protocol supporting the movement of the data, such as Transmission Control Protocol (TCP), HTTP or User Datagram Protocol (UDP). The application layer is the interface between the IoT device and the network with which it will communicate.	**CO1**	
19	**UseofEmbeddedsystemsinIoT.** Embedded systems have a range of applications in the IoT sector. They can control and monitor devices, collect data, and communicate with users. For instance, they can monitor a room's temperature and adjust the thermostat. They can also be used to check a car's performance and alert the driver if there's an issue.	**CO1**	
20	**Statecommunicationprotocols.** A communication protocol is a system of rules that allows two or more entities of a communications system to transmit information via any variation of a physical quantity. The protocol defines the rules, syntax, semantics, and synchronization of communication and possible error recovery methods.	**CO1**	

PART - B

1) Discuss the characteristic of IoT and explain.
2) What are applications of IoT and explain?
3) Demonstrate the physical design of IoT with Things of IoT and protocols of IoT.
4) Write the logical design of IoTwithcommunication models.
5) Explain the IoT communication APIs and its importance.
6) Discuss about any three IoTenablingtechnologies.
7) Illustrate the IoT level 1 with diagram.
8) Differentiate the IoT level 2 and level 4 in detailed.

UNIT-2

<table>
<tr><th>No.</th><th>Question</th><th>CO</th><th>BT Level</th></tr>
<tr><td colspan="4">UNIT–2:IOTANDM2M</td></tr>
<tr><td colspan="4">PART-A(TwoMarksQuestions)</td></tr>
<tr><td>1</td><td colspan="2">ExaminewhetherM2MandIoTare same?</td><td>CO2</td><td></td></tr>
<tr><td></td><td>Basis</td><td>M2M</td><td>IoT</td><td></td></tr>
<tr><td></td><td>Connection Type Used</td><td>Simple device-to-device communication usually within an embedded software at the client site.</td><td>Devices use IP networks to communicate.</td><td></td></tr>
<tr><td></td><td>Communication</td><td>Communication directly between machines.</td><td>IoT sensors automation.</td><td></td></tr>
<tr><td></td><td>Communication Protocol Used</td><td>Communication technology techniques and traditional protocols.</td><td>Internet protocols like HTTP, FTP and Telnet.</td><td></td></tr>
<tr><td></td><td>Intelligence</td><td>Observation of some degree of intelligence.</td><td>Objects are responsible for decision-making.</td><td></td></tr>
<tr><td></td><td>Technology</td><td>Hardware-based.</td><td>Hardware and Software-based.</td><td></td></tr>
<tr><td></td><td>Data Sharing</td><td>Data sharing among communicating parties only.</td><td>Data sharing between other applications to improve the end-user experience.</td><td></td></tr>
<tr><td></td><td>Scope</td><td>Deployed in a closed system.</td><td>Connects to a larger network.</td><td></td></tr>
<tr><td></td><td>Open API Support</td><td>No open API support.</td><td>Supports open API integration.</td><td></td></tr>
<tr><td></td><td>Internet</td><td>Devices do not rely on internet connection.</td><td>An active internet connection is required.</td><td></td></tr>
<tr><td>2</td><td colspan="3">DefineM2M.
Machine-to-machine, or M2M, is a broad label that can be used to describe any technology that enables networked devices to exchange information and perform actions without the manual assistance of humans.</td><td>CO2</td><td></td></tr>
<tr><td>3</td><td colspan="3">DifferentiatebetweenIoTandM2M.</td><td>CO2</td><td></td></tr>
<tr><td>4</td><td colspan="3">JustifythereasonsforusingM2MandIoT.</td><td>CO2</td><td></td></tr>
<tr><td>5</td><td colspan="3">DefineM2MCommunication.
M2M communications refer to automated applications which involve machines or devices communicating through a network without human intervention.</td><td>CO2</td><td></td></tr>
<tr><td>6</td><td colspan="3">SummarizetheadvantagesofM2Mcommunication.
➨It is easy to roll out and maintain.</td><td>CO2</td><td></td></tr>
</table>

	➡It is available with fixed and mobile networks both indoors and outdoors. ➡It offers higher range, minimum latency, higher throughput and consume less energy. ➡It enables communication of smart devices without any human intervention.		
7	**ListoutthedisadvantagesofM2M communication.** ● Security and large-scale data collection is a significant concern. ● It was designed and optimised to be used for only a small number of connected devices. ● Interoperability between cloud and IoT devices in such networks is often limited.	**CO2**	
8	**TellthekeyapplicationareasofM2Mcommunication.** ● Smart Meters. ● In-car Telemetry Services. ● Smart Asset Tracking Services. ● Wearable Technologies. ● Supply Chain Management (SCM) Solutions.	**CO2**	
9	**DiscussthecharacterizeofM2M.** The main components of an M2M system include sensors, RFID, a Wi-Fi or cellular communications link, and autonomic computing software programmed to help a network device interpret data and make decisions. These M2M applications translate the data, which can trigger preprogrammed, automated actions.	**CO2**	
10	**DefineGlobalvalueChains.** International production, trade and investments are increasingly organised within so-called global value chains (GVCs) where the different stages of the production process are located across different countries.	**CO2**	
11	**DefineGVC.** Global Value Chain (GVC) is the series of stages in the production of a product or service for sale to consumers. Each stage adds value, and at least two stages are in different countries.	**CO2**	
12	**IdentifytheprocessofM2Mvaluechains.** As mentioned previously, M2M value chains are internal to one company and cover one solution. IoT Value Chains, meanwhile, are about the use and reuse of data across value chains and across solutions. M2M value chains are internal to one company and cover one solution.	**CO2**	
13	**LabeltheprocessofIoTvaluechains.** There are four main layers in the IoT value chain: 1) Hardware; 2) Connectivity Platforms, 3) Software, and; 4) Solution Providers.	**CO2**	
14	**BuildI-GVC.** The Intelligent Ground Vehicle Competition (IGVC) is an annual international robotics competition for teams of undergraduate and graduate students. Teams design and build an autonomous ground vehicle capable of completing several difficult challenges.	**CO2**	
15	**Definedata factory.** Data Factory is a managed cloud service that's built for complex hybrid extract-transform-and-load (ETL), extract-load-and-transform (ELT), and data integration projects.	**CO2**	
16	**NametheInputsofI-GVC.**	**CO2**	
17	**ListoutthetwocategoriesofInformationProduct.** There are two types of IoT: CIoT and IIoT. The differences between CIoT and IIoT are:	**CO2**	

	CIoT often focuses on convenience for individual customers, whereas IIoT is strongly focused on the industry sector, improving the efficiency, security, and output of operations with a focus on Return on Investment (ROI).		
18	**Showtheinputofvaluechain.**	**CO2**	
19	**Listouttheoutputofvaluechain.** The IoT value chain illustrates how the different components, in combination with one another or separately, add value to the overall IoT solution and, in turn, for the end user.	**CO2**	
20	**DescribethebarriersandconcernsofIoT** Adopting new technology can be expensive and so is the implementation of IoT. So many startups find it hard to provide the necessary capital for the initial investment. This is one of the biggest barriers to IoT adoption. Businesses need to understand that investing in IoT is a long-term profit.	**CO2**	

PART-B

1) Explain M2M Value Chains.
2) Discuss IoT architecture outline with diagram.
3) Explain IOT Value Chains using figure.
4) Define M2M. Explain reasons of shifting from M2M to IoT.
5) Explain Main design principles and needed capabilities of IOT.
6) Explain I-GVC using figure.
7) What is Global Value Chain? Explain it with a diagram.
8) Explain M2M Value Chains.
9) IoT-A Architecture.

UNIT-3

No.	Question	CO	BT Level
	UNIT– 3:IOTARCHITECTURE		
	PART-A(TwoMarksQuestions)		
1	**DefineIETFAndOGC** The Internet Engineering Task Force (IETF) develops open standards through transparent processes with one goal in mind: to make the Internet work better. The OGC SensorThings API provides an open, geospatial-enabled and unified way to interconnect the Internet of Things (IoT) devices, data, and applications over the Web.	**CO3**	
2	**IllustratethevariousprimitivesofM2Mcommunication.** Machine-to-machine (M2M) communication is becoming an increasingly important part of mobile traffic and thus also a topic of major interest for mobile communication research and telecommunication standardization bodies. M2M communication offers various ubiquitous services and is one of the main enablers of the vision inspired by the Internet of Things (IoT).	**CO3**	
3	**ListoutthemajorobjectivesofhighlevelETSIarchitecture.** ● The M2M Device is capable of performing registration, authentication, authorization, management, and provisioning to the Network Domain. ● Direct connection also means that the M2M device contains the appropriate physical layer to be able to communicate with the Access Network.	**CO3**	
4	**SummarizethelayersofIETFarchitectureofIoT.** The five layers are perception, transport, processing, application, and business layers (see	**CO3**	

<table>
<tr><td></td><td>Figure 1). The role of the perception and application layers is the same as the architecture with three layers.</td><td></td><td></td></tr>
<tr><td>5</td><td>ClassifytheperceptionlayerinIoT.
The perception layer of an IoT system architecture, also known as the device layer, consists of multiple elements – sensors, cameras, actuators, and similar devices that gather data and perform tasks. For example, an IoT sensor used on an automotive assembly line can conduct a quality control check on a nearby robot.</td><td>CO3</td><td></td></tr>
<tr><td>6</td><td>FormulateNetworkandapplicationlayer.
The application layer is the top portion, or Layer 7, of the Open Systems Interconnection (OSI) model. OSI is a concept meant to describe how network systems operate. The model begins with the physical infrastructure necessary for the internet and computer systems to exist and ends with the application layer.</td><td>CO3</td><td></td></tr>
<tr><td>7</td><td>Compareobjectabstractionwithdataabstraction.
<table><tr><th>Object Abstraction</th><th>Data Abstraction</th></tr><tr><td>In object-oriented programming, abstraction is one of three central principles (along with encapsulation and inheritance).</td><td>Data abstraction is the reduction of a particular body of data to a simplified representation of the whole.</td></tr><tr><td>Through the process of abstraction, a programmer hides all but the relevant data about an object in order to reduce complexity and increase efficiency.</td><td>Abstraction, in general, is the process of removing characteristics from something to reduce it to a set of essential elements.</td></tr></table></td><td>CO3</td><td></td></tr>
<tr><td>8</td><td>Analyzetheapplicationlayer.
The application layer sits at Layer 7, the top of the Open Systems Interconnection (OSI) communications model. It ensures an application can effectively communicate with other applications on different computer systems and networks.</td><td>CO3</td><td></td></tr>
<tr><td>9</td><td>Whatisthepurposeofbusinesslayer?
The Business Layer is the place where all the business/domain logic, i.e. rules that are particular to the problem that the application has been built to handle, lives. This might be salary calculations, data analysis modelling, or workflow such as passing a order through different stages.</td><td>CO3</td><td></td></tr>
<tr><td>10</td><td>ShowtherequirementsofOGCarchitecture.
The OGC Reference Model describes a framework for the ongoing work of the Open Geospatial Consortium (OGC) and their specifications and implementing interoperable solutions and applications for geospatial services, data, and applications. It is not an OGC standard.</td><td>CO3</td><td></td></tr>
<tr><td>11</td><td>Differentiatesensorobservationandplanningservices.
<table><tr><th>sensorobservation</th><th>planningservices</th></tr><tr><td>The Sensor Observation Service (SOS) is a web service to query real-time sensor data and sensor data time series and is part of the Sensor Web.</td><td>Whether you work for a city, a utility or an industrial company, it’s never been more essential to digitize your infrastructure. A well-executed IoT network enables multiple devices to connect and exchange data, driving process transparency.</td></tr></table></td><td>CO3</td><td></td></tr>
<tr><td>12</td><td>Whatdoyouunderstandbyincidentmanagementinformationsharing?
The Incident Management Information Sharing (IMIS) CMM will enable the maturation of incident management-related information sharing processes and capabilities. It is intended to improve and broaden the sharing of specific information that originates within episodes of incident response and support.</td><td>CO3</td><td></td></tr>
<tr><td>13</td><td>DefineDomainmodel.
In software engineering, a domain model is a conceptual model of the domain that</td><td>CO3</td><td></td></tr>
</table>

	incorporates both behavior and data. In ontology engineering, a domain model is a formal representation of a knowledge domain with concepts, roles, datatypes, individuals, and rules, typically grounded in a description logic.		
14	**Telltheuseofinformationmodel.** The main purpose of an Information Model is to model managed objects at a conceptual level, independent of any specific implementations or protocols used to transport the data.	**CO3**	
15	**Listoutthefeaturesoffunction model.** ● Process: Illustrates transformation from input to output. ● Store: Data-collection or some sort of material. ● Flow: Movement of data or material in the process. ● External Entity: External to the modeled system, but interacts with it.	**CO3**	
16	**DefineCommunicationmodel.** The communication model is a systematic representation of the procedure that aids in understanding the human communication process. Models depict the process symbolically and conceptually. They also help to simplify the complex process of conversing and establish where and with whom communication occurs.	**CO3**	
17	**NamethechallengesofOGCarchitecturemodel.** One of the greatest **challenges** for computing today involves providing access to large volumes of distributed multimedia data. Mapping and personal.	**CO3**	
18	**Illustratethedifferenttypesofcommunicationmodel.** The three models of communication we will discuss are the transmission, interaction, and transaction models. Although these models of communication differ, they contain some common elements.	**CO3**	
19	**Analyzethedevicetocloudcommunication.** In the device-to-cloud communications model the device itself connects directly to an Internet cloud service or server like an application server. This cloud server facilitates the exchange of data and control of communications.	**CO3**	
20	**NamethefeaturesofIoTreference model.** The IoT Functional Model aims at describing mainly the Functional Groups (FG) and their interaction with the ARM, while the Functional View of a Reference Architecture describes the functional components of an FG, interfaces, and interactions between the components.	**CO3**	

PART-B

1) Explain ETSI M2M high-level architecture.
2) Explain IOT reference model.
3) Explain IOT function view.
4) Explain IOT reference architecture's deployment and operational view.
5) Explain reference architecture of IOT using figure.
6) Explain Functional View, Information View, Deployment and Operational View, Other Relevant architectural views of IOT reference architecture.
7) Explain Architecture Reference Model of IOT using figure.
8) What is IoT Domain Model?
9) Explain Open Geospatial Consortium Architecture with a diagram

UNIT-4

No.	**Question**	**PO Attainment**	**BT Level**	**Usage**
	UNIT– 4:M2MANDIOT			

	TECHNOLOGYFUNDAMENTALS			
	PART-A(TwoMarksQuestions)			
1	**Listoutthepropertiestocharacterizethedevices.**	**CO4**		
2	**Statethefunctionofgateway.**	**CO4**		
3	**Namethetwogroupsofdevices.**	**CO4**		
4	**GivethedeploymentscenariosforHomealarms.**	**CO4**		
5	**SummarizetheroleofDataManagement.**	**CO4**		
6	**ExplainDeviceManagement.**	**CO4**		
7	**ListoutthethreedifferentfunctionsofGatewaysasfirewall.**	**CO4**		
8	**Whatismeantbynode?**	**CO4**		
9	**WhatismeantbyWideAreaNetwork?**	**CO4**		
10	**StatethefunctionofData Acquisition.**	**CO4**		
11	**ExplainthefunctionofDataValidation.**	**CO4**		
12	**IdentifythepurposeofDataPreprocessing.**	**CO4**		
13	**Definecloudcomputing.**	**CO4**		
14	**ListoutthefourV'sinBigData?**	**CO4**		
15	**WhatismeantbyPowerLineCommunication?**	**CO4**		
16	**DefineSpatialData.**	**CO4**		
17	**Whatismeantbypredictiveanalysis?**	**CO4**		
18	**Defineclustering.**	**CO4**		
19	**SummarizethefunctionofActionPredictionmodel.**	**CO4**		
20	**WhenthedataiscalledasWeekTypeData?**	**CO4**		

PART-B

1) What the shopping basket can tell: IoT for retailing industry?
2) Explain in brief future factory concepts.
3) Describe four aspects in your business to master IoT.
4) Explain needs of IoT for Oil and Gas Industry.
5) Explain value creation from big data and serialization.
6) Enlist challenges faced by industry related IoT Applications.
7) Explain four Aspects in one's business to master IoT.
8) Explain eHealth IOT applications.
9) Explain security concerns for industry.
10) What the shopping basket can tell: IoT for retailing industry?
11) Explain in brief future factory concepts.
12) Discuss IoT for Oil and Gas Industry.
13) Explain: The smart factory.

UNIT-5

Question No.		**CO**	**BT Level**	**Usage**
	UNIT–5:BUILDINGIOTWITHARDUINO ANDRASPBERRYPI			
	PART-A(TwoMarksQuestions)			
1	**AnalyzethefeaturesofRaspberry PI.**	**CO5**		
2	**DefineRaspberryPI.**	**CO5**		

3	**Examinehowthesystemon chip.**	**CO5**		
4	**SummarizethebenefitsofSoC.**	**CO5**		
5	**Listoutthestepsusedininternetgatewaydevice.**	**CO5**		
6	**JustifythesignificantofIoTsystems.**	**CO5**		
7	**DefineLogicaldesignusing python.**	**CO5**		
8	**AnalyzetheIoTphysicaldevicesandEndpoints.**	**CO5**		
9	**IllustratethebuildingblocksofIoTdevice.**	**CO5**		
10	**NameanyfourservicesofferedbyRaspberryPi.**	**CO5**		
11	**JustifyhowalinuxOsisusefulinIoT.**	**CO5**		
12	**DifferentiateRaspberrywithArduino.**	**CO5**		
13	**WhataretheinterfacesinRaspberry?**	**CO5**		
14	**NamethedifferentIoTplatforms.**	**CO5**		
15	**Analyzehowprogrammingraspberrypiworks.**	**CO5**		
16	**DefineArduino.**	**CO5**		
17	**GeneralizeastohowArduinoworks.**	**CO5**		
18	**WhatisthepurposeofactuatorsinIoT?**	**CO5**		
19	**NametheNeedForsensorsinIoT.**	**CO5**		
20	**DemonstrateEvent–drivenindustrialIoTsystems?**	**CO5**		

PART-B

1) Describe the relative strength and limitation of Building IOT with RASPERRY PI
2) List the features in IoT systems
3) Describe Logical design using python in detail.
4) Summarize the IoT physical Devices in detail.
5) Discuss on Endpoints in IoT.
6) Draw and explain the building blocks of IoT device
7) Explain the concepts involved in Raspberry Pi.
8) Discuss in detail about Arduino with neat sketch.
9) Construct the Design of Smart home with Raspberry Pi and other hardware devices with neat sketch. Formulate the significant use of Raspberry Pi in Smart cities and Industrial appliances.