KONGU ENGINEERING COLLEGE, PERUNDURAI 638 060

CONTINUOUS ASSESSMENT TEST 1

(Regulations 2022)

Month and Year : AUGUST and 2024	Roll Number:
Programme : B.E Branch : CSE Semester : VI	Date : 31.08.2024 Time : 9.15 to 10.45am
Course Code : 22CST51 Course Name : Internet of Things and Cloud Computing	Duration : 1 ½ Hours Max. Marks : 50

PART - A (10 × 2 = 20 Marks)
ANSWER ALL THE QUESTIONS

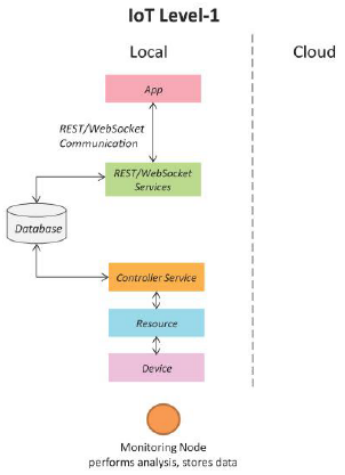
1.	Why should IoT incorporate interoperable communication protocols and self-adapting capabilities? ● Enabling seamless communication with other devices and infrastructure.(1 M) ● Adjusting modes and settings based on environmental conditions and contextual changes to optimize performance. (1 M)	[CO1]	[K2]
2.	Differentiate between IoT and M2M communication in terms of their key characteristics and use cases. (Any 2)	[CO1]	[K2]

CRITERIA	M2M (Machine-to-Machine)	IoT (Internet of Things)
Communication	Focus below network layer	Focus above network layer
Machines	Homogeneous	Heterogeneous
H/W vs S/W	Hardware	Software
Storage	Point solutions, often in on-premises storage	Data is collected in the cloud

3.	Why link layer is important for ensuring efficient communication between IoT devices? ● Determines how the data is physically sent over the network physical layer or medium (e.g copper wire, coaxial cable or radio wave) ● Scope of the link layer is the local network connection to which host is attached	[CO1]	[K2]

<table>
<tr><td>4.</td><td>Identify any four Websocket architectural constraints(Any 4)
Stateful
Bidirectional
Exclusive Pair model
Involves TCP connection for all requests
Does not involve overhead of headers
Only vertical is easier</td><td>[CO1]</td><td>[K2]</td></tr>
<tr><td>5.</td><td>Outline the components of the IoT functional block.
Device
Communication
Services
Management
Security
Application
Or
IoT Functional block diagram</td><td>[CO1]</td><td>[K2]</td></tr>
<tr><td>6.</td><td>In a home automation system where a single node manages the remote control of lights and appliances using electronic relay switches and maintains the status of each device in a local database, analyze the appropriate abstraction level for this scenario and draw the corresponding diagram.

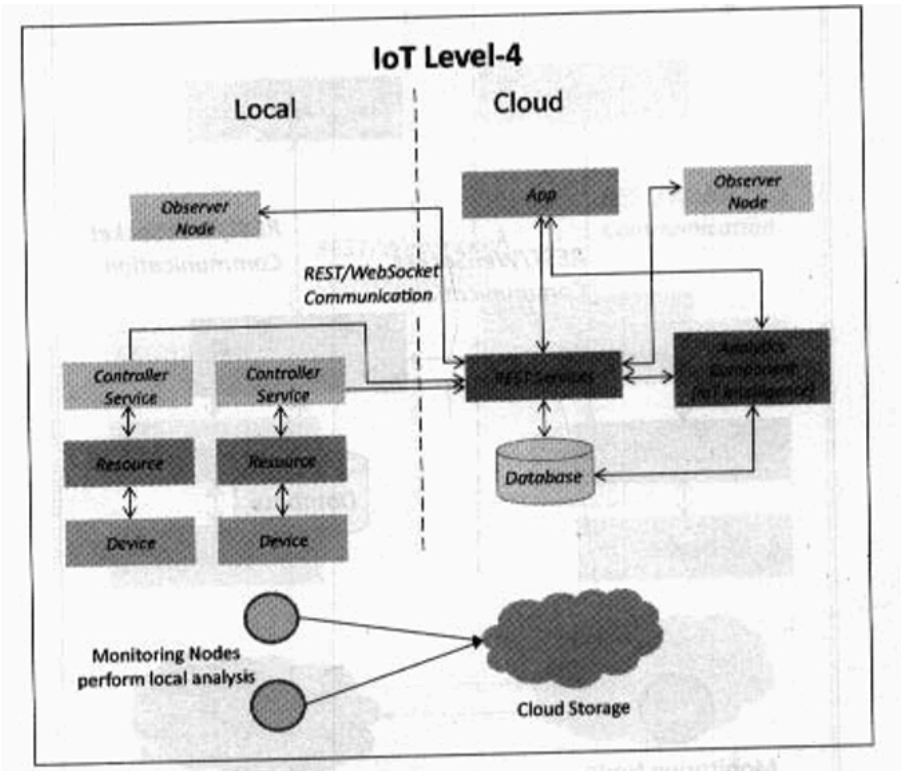
Level 1 (1 Mark)

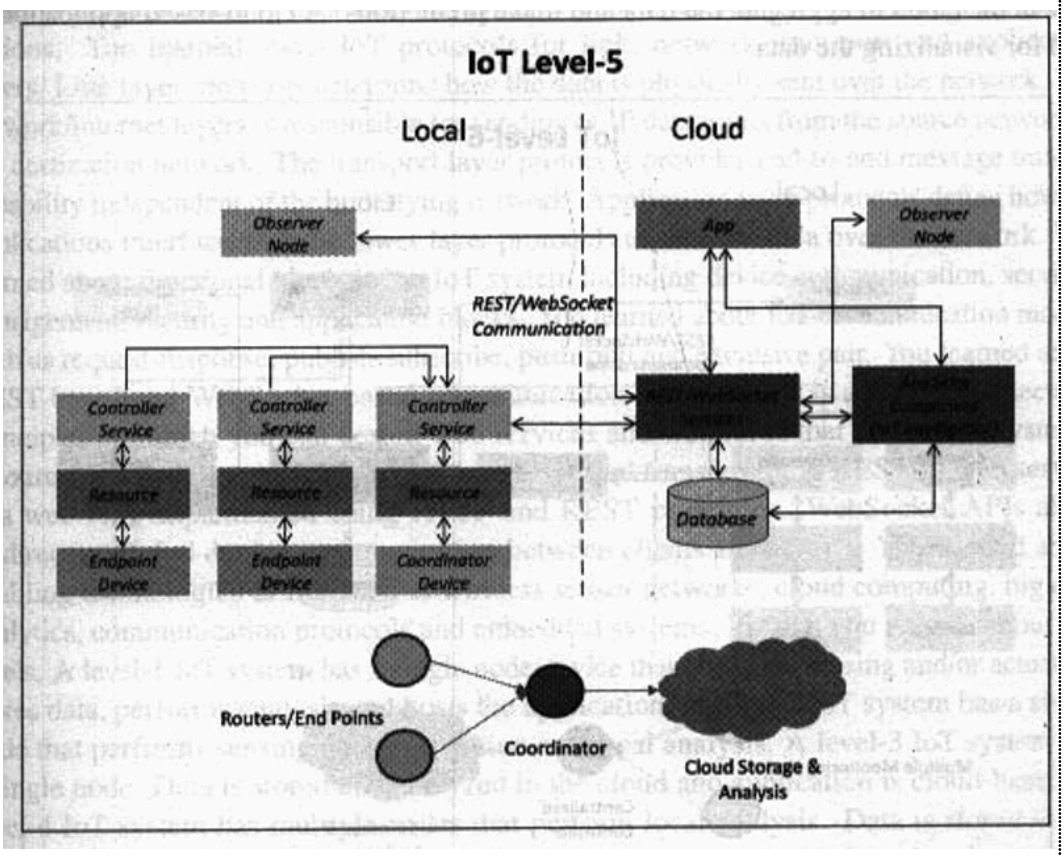
Diagram (1 Mark)
 
</td><td>[CO1]</td><td>[K4]</td></tr>
<tr><td>7.</td><td>How IoT sensors can be used to monitor indoor air quality?
Harmful and toxic gases can cause serious health problem.
Can identify the hazardous zones so that corrective measures can taken to ensure proper ventilation.</td><td>[CO1]</td><td>[K2]</td></tr>
<tr><td>8.</td><td>Interpret the purpose of the application layer in the layered architecture of IoT.
Provides the diverse kinds of services requested by the customer.
Various types of smart services, which are offered by various IoT verticals.</td><td>[CO2]</td><td>[K2]</td></tr>
<tr><td>9.</td><td>Differentiate Fully functional and Reduced functional devices. (Any 2)<table><tr><td>Fully Functional Device</td><td>Reduced Functional Device</td></tr></table></td><td>[CO2]</td><td>[K2]</td></tr>
</table>

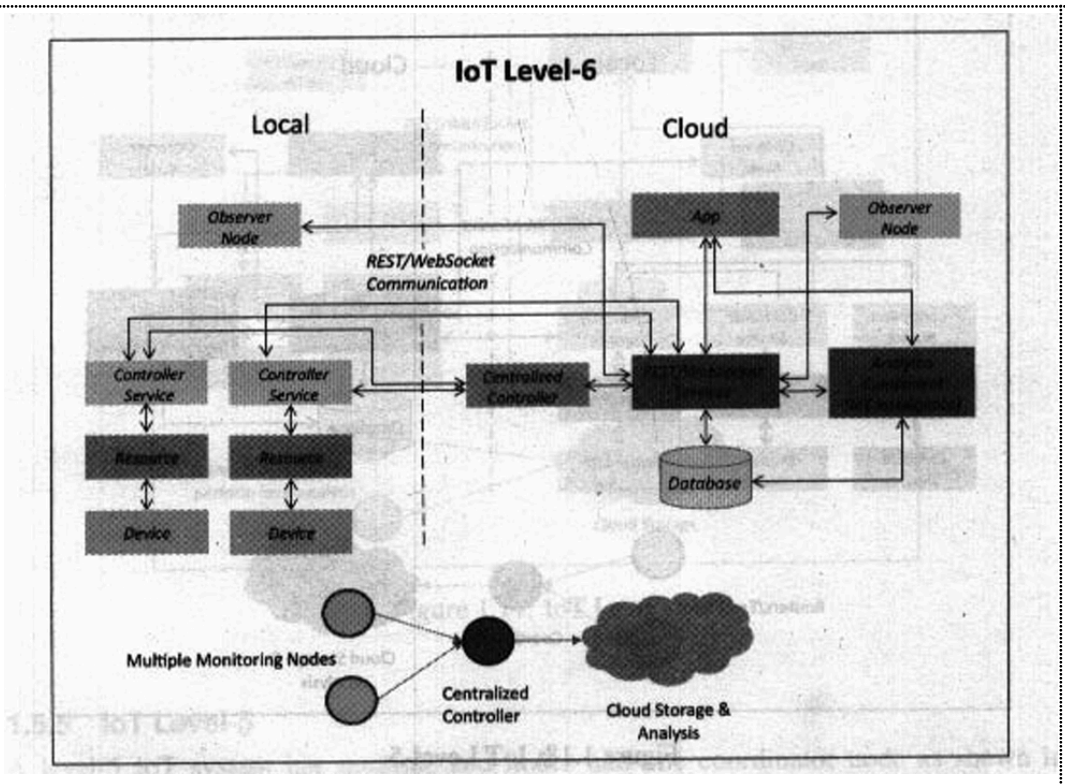
	FFDs can act as personal area network (PAN) coordinator or as just a normal node.	RFDs are very simple nodes, and they have constrained resources.		
	The coordinator has the capability to create, control, and maintain the network.	They can only communicate with a coordinator node		
	Supports Star, Peer-to-peer & Cluster-tree	Supports Star topology		
10.	Sketch the DODAG graph for the given constraints, ensuring that tasks are completed in the correct order without forming cycles, in alignment with the acyclic nature of a DAG. Identify the root node and the final leaf node: (i) Task A must be completed before Task B (ii) Task B must be completed before Task C. ● A□B□C (1 Mark) ● Root Node A and Leaf Node C (1 Mark)		[CO2]	[K3]

Part – B (3 × 10 = 40 Marks)
ANSWER ANY FOUR QUESTIONS

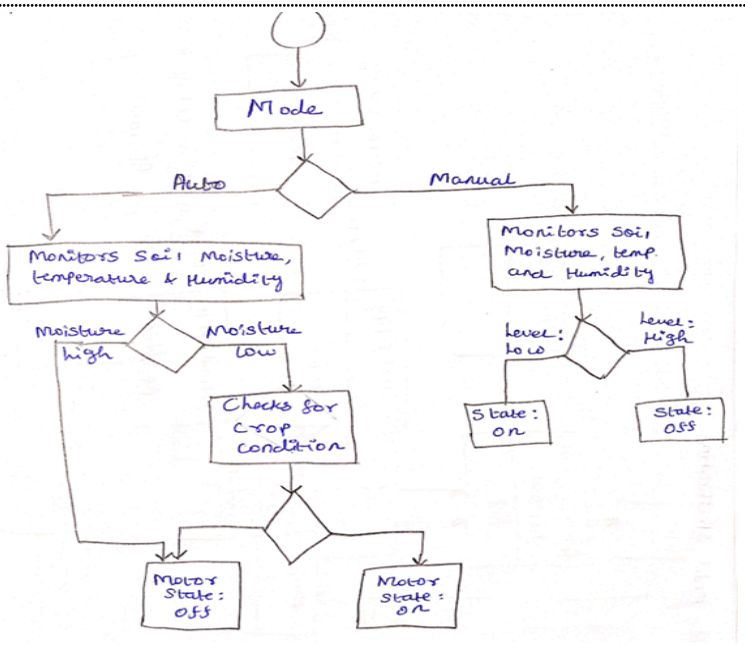
11.		Imagine you're tasked with designing a prototype for a real-time traffic monitoring system using IoT. The system needs to collect data from traffic cameras and sensors, optimize traffic light timings based on real-time traffic conditions, provide automated guidance to drivers through a mobile app and offer real-time updates to manage congestion in urban areas. Analyse a suitable IoT level for the above scenario and justify your chosen level. Level Identification (2 marks) Level 4 | Level 5 | Level 6 Justification (3 marks) For the real-time traffic monitoring system **Level 4 or Level 5** or **Level 6** are most suitable. It supports advanced sensor integration, real-time data processing, and localized decision-making. This allows for dynamic traffic light optimization, automated driver guidance via mobile apps, and effective congestion management. Diagram related to the concept in (Level 4 | Level 5 | Level 6) using (5 marks)	(10)	[CO1]	[K4]


IoT Level-4
Local
Cloud
Observer Node
App
Observer Node
REST/WebSocket Communication
Controller Service
Controller Service
Resource
Resource
Device
Device
Database
Monitoring Nodes perform local analysis
Cloud Storage

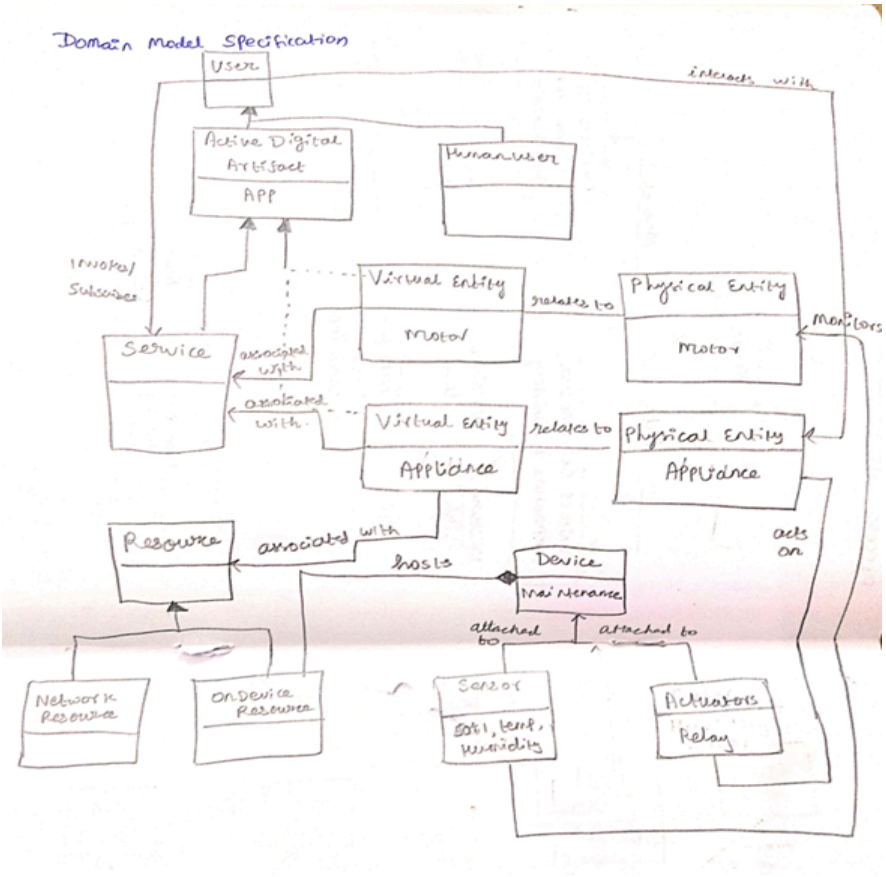

IoT Level-5
Local
Cloud
Observer Node
App
Observer Node
REST/WebSocket Communication
Controller Service
Controller Service
Controller Service
Resource
Resource
Resource
Endpoint Device
Endpoint Device
Coordinator Device
Database
Routers/End Points
Coordinator
Cloud Storage & Analysis



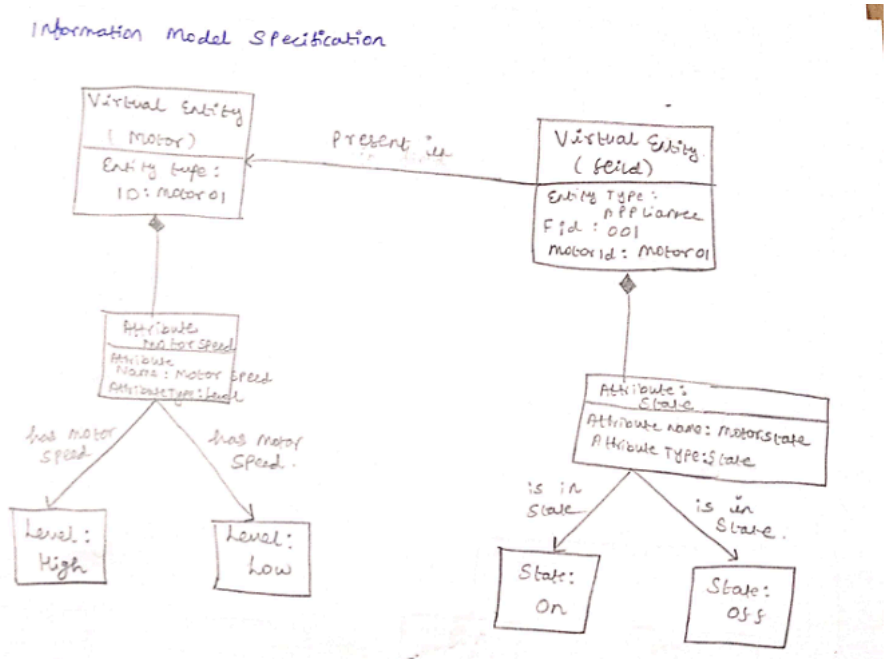
12.		Consider the Smart Agriculture system that monitors soil moisture, temperature and humidity in real-time to optimize irrigation and farming practices. The system can trigger irrigation based on real-time data, improving water efficiency. Components include soil moisture sensors, temperature sensors, actuators for irrigation control, a wireless communication module and a cloud platform for data analytics. For the above system, design the following: 1) Purpose and requirement specification 2) Process specification 3) Domain mode specification 4) Information model Specification 5) Service Specification **Smart Agriculture System Design** **1) Purpose and Requirement Specification (2 marks)** **Purpose**: The Smart Agriculture System aims to enhance farming practices by optimizing irrigation based on real-time monitoring of soil moisture, temperature, and humidity. This helps in improving water efficiency, reducing wastage, and increasing crop yield. **Requirements**: • **Sensors**:. • **Actuators**: • **Communication Module**: • **Data Analytics Platform**: • **User Interface**: **Real-Time Alerts**: **2) Process Specification (2 marks)**	(10)	[CO1]	[K3]



3) Domain Model Specification (2 marks)

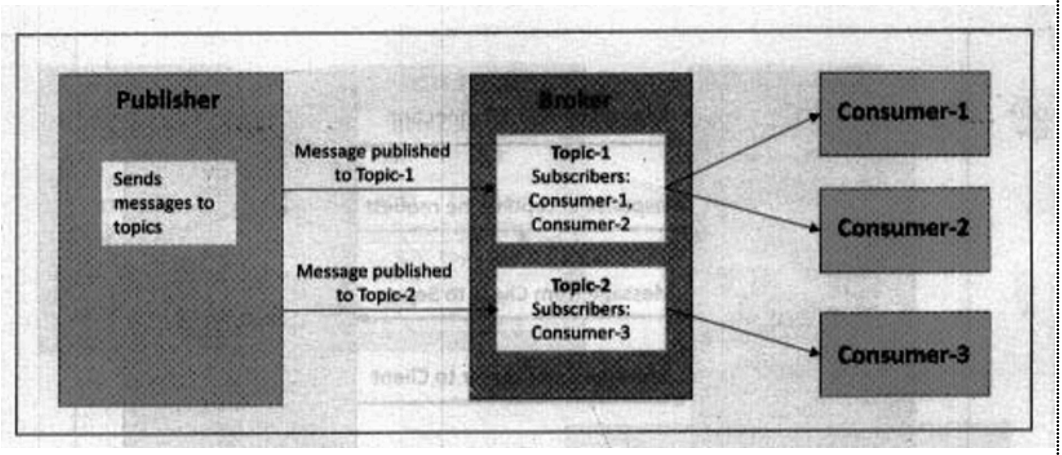


4) Information Model Specification (2 marks)



5) Service Specification (2 marks)

Combine Process and information model specification

13.		Given a smart home security system where individual cameras and sensors publish data directly to a central hub. Identify and apply the most suitable IoT communication model for ensuring secure and efficient data transmission and justify your choice. Model identification (1 mark) **Publish Subscribe** Explanation (4 Marks) • Publish Subscribe is a communication model that involves publisher brokers and consumers. • Publisher are the source of data. • Publisher send the data to the topics Diagram (3 marks)  Justification (2 marks)	(10)	[CO1]	[K3]
14.		Illustrate the construction of Destination Oriented Directed Acyclic Graph in RPL with a neat diagram.	(10)	[CO2]	[K2]

Routing Protocols – RPL (Any 2 points 2 marks)

- A **Distance Vector Routing Protocol** that creates a tree-like routing topology called the Destination Oriented Directed Acyclic Graph (DODAG)
- support **minimal routing needs** by building a highly robust topology over lossy networks
- support **various types of traffic models:**
    - multipoint-to-point, point-to-multipoint, and point-to-point
- Devices are connected to each other in such a way that **no cycles are present in the connection**
    - Done using a node called **destination oriented directed acyclic graph (DODAG)**, which is routed at a single destination

<u>Defines two modes for each node: (2 marks)</u>

- **Storing mode: All nodes contain the entire routing table** of the RPL domain. Every node knows how to reach every other node directly.
- **Non-Storing mode: Only the border router(s) of the RPL domain contain(s) the full routing table**. All other nodes in the domain maintain their list of parents only

RPL: DODAG(4 marks)

- Used by RPL to maintain routing topology and update routing information.
- A parent node can have multiple child nodes
- A child node can have multiple parent nodes
- Each node knows its parent node but does not have any information about its child nodes
- Maintains at least a single path from each node to the root and the preferred parent

Serial Number	Name of the Message	Description
1	DODAG information object (DIO)	This message is used to keep the current rank (level) of the node, determine the distance of each node to the root based on some specific metrics, and choose the preferred parent path.
2	Destination advertisement object (DAO)	This message is used to unicast destination information toward selected parents of a node. This control message helps RPL to maintain upward and downward traffic.
3	DODAG information solicitation (DIS)	This message is used by a specific node in order to acquire DIO messages from another reachable adjacent node.
4	DAO acknowledgment (DAO-ACk)	This message is used as a response to a DAO message and is sent by a DAO recipient node like a DAO parent or DODAG root.

Any DODAG Diagram (2 marks)

Bloom's Taxonomy Level	Remembering (K1)	Understanding (K2)	Applying (K3)	Analysing (K4)	Evaluating (K5)	Creating (K6)
Percentage	--	43.33	36.67	20	--	--