Iot Prelimils Paper

(Q-1)

1. 1960s :- The Concept of interconnected computers began with the ARPANET, funded by DARPA in 1969

1980s :- First connected devices One of the first Iot devices was a cocol-cola vending machine at Carnegie Mellon university, connected to the internet in the early 1980s

1990 :- The "Internet Toaster" John Romkey connected a toaster to The internet for the first time, enabling remote control

1993 :- First webcam Engineers at the University of Cambridge created the first internet-connected camera to monitor a coffee pot

1998 :- IPV6 Development IPV6 was introduced, allowing for an enormous increase in the number of devices that could be connected to the internet.

1999 :- Term IoT The term "Internet of Things" was coined by kevin Ashton, a British technology pioneer, during his work at MIT'S Auto-ID Labs.

- Modern Evolution and Applications

2000 :- Consumer and Industrial Adoption The early 2000s saw the rise of consumer devices like Smart thermostats and industrial applications such as RFID for supply chain Management / Cognite9.

2010 - IoT Proliferation This decade witnessed a massive growth in IoT devices, with applications expanding to smart homes healthcare, agriculture, and industry.

2020 - IoT and Emerging Technologies The integration of IoT with AI, machine learning, and 5G networks has further expanded its capabilities, leading to more advanced application like smart cities autonomous vehicles, and Real life time data analytics.

2. Sensors

- Devices that collect data from the environment such as temperature, humidity, motion, or light.
- A thermometer measuring room temperature.

Actuators

- Devices that take action based on data received often making physical adjustments.
- A thermostat changing the room temperature

Connectivity

- The methods through with sensors, devices, and systems communicate with each other.
- wifi, Bluetooth, zigbee, LoRaWAN, Cellular networks.

Data Processing

- systems and algorithms ~~for~~ that analyze the data collected from IoT devices.
- Analyzing temperature data to control HVAC system.

Edge computing

- Processing data close to the source of data generation to reduce latency and bandwidth use.
- A Smart camera processing video footage locally before sending relevent data to the cloud.

Cloud Computing

- Using remote servers to store, manage, and process data, offering scability and reduced costs.
- storing and analyzing large datasets from multiple IoT devices in the cloud.

Security and privacy

- Measures to protect data and devices from unauthorized access and breaches
- Encryption, Secure Communication protocols,

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Q-1(A)

I. Smart Homes

- Home automation system like Smart lighting, Smart thermostats, Smart locks, and security cameras.
- Smart thermostats learning your schedule to optimize heating and cooling

Healthcare

- Wearable fitness trackers, remote patient monitoring, and Smart medical devices.
- Wearables tracking physical activity and vital signs.

Industrial IoT

- Predictive maintenance, asset tracking, and Smart manufacturing
- Sensors on factory machines predicting maintenance needs preventing breakdowns
- Enhanced logistics through real-time tracking of goods and assets

Agriculture

- Precision farming, smart irrigation systems, and livestock monitoring
- Soil sensors measuring moisture and nutrients optimizing irrigation and fertilization.

Smart cities

- Traffic management, waste management, and energy-efficient buildings.
- Smart bins signaling when they need to be emptied.

2. Security and Privacy

- IoT devices often transmit sensitive data, making them prime targets for hackers.
- Ensuring that only authorized users can access and control devices is critical.

Interoperability

- Devices from different manufacturers may not communicate efficiently due to varied standards and protocols.
- The absence of a universal standard hinders seamless integration.

Scalability

- As the number of connected devices grows, managing and maintaining them becomes complex.
- The vast amount of data generated can overwhelm network infrastructure and processing capabilities.
- Implementing efficient network management system and edge computing to process data locally.

Q-2(A)

I. Perception layer

- This is the first layer, consisting of sensors and actuators that gathers data from the physical environment.
- Sensors RFID Tags, QR codes.
- Collecting data and converting it into digital signals

Network Layer

- This layer facilitates data transmission between devices and servers

- Gatways, routers, protocols.
- Ensuring reliable data transfer through various communication channels.

Edge / Fog Computing layers

- often included between the network and processing layers, this layer handles data processing close to where it's generated to reduce latency
- Edge devices, fog nodes.
- Real-time data processing, analysis, and storage.

Processing layers

- This layers involves the computational processes that analyze and manipulate the collected data
- Servers, cloud platforms, data centers.

Application layers

- This layer where end-users interact with the IoT system.
- Uses interfaces APIs.
- Providing tailored services and applications based on the processed data.

Q-2 (A)

2.

1. The technology behind the IoT encompasses a wide range of components and systems that work To gather to enable the seamless connectivity.

(5) Sensors and Actuators

- Devices that collect data from the environment, such as temperature, humidity light, motion, and more
- Devices that perform actions based on commands recived such as turning on a light, adjusting a thermostat, or opening a valve.

(5) Competivity

- Technologies like wi-fi Bluetooth, Zigbee and LoRa enable wiseless communication between devices.
- 2G, 3G, 4G, and 5G networks provide wide-area coverage and high-speed data transmission.
- Enables short-range communication between devices for tasks like contactless payments.

2. Machine To Machine (M2M)

- M2M communication is a key aspect of the Internet of Things.
- It refers to the direct exchange of information between devices without human invention.

Key components of M2M communication.

- These are endpoints equipped with sensors, actuators, or other data collection tools.
- They gather and transmit data.

- M2M communication relies on various network technologies such as wi-fi, cellular networks, Bluetooth, zigbee, and LoRaWaN to transmit data.

- These devices act as intermediaries, aggregating data from multiple devices and forwarding it to the cloud or other system.

- Centralized system that process, store, and analyze the data collected from M2M devices

- Software applications that provide insights and control based on the data received from M2M communication.

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1. Sensors are fascinating devices that detect and respond to changes in their environment.
- They convert physical phenomena into signals that can be measured and recorded.

Digital sensors

1. High Accuracy
2. Ease of Integration
3. Noise Resistance
4. Compact size

Common Type of Digital sensors

1. Temperature sensors
2. Proximity sensors
3. Light sensors
4. Pressure sensors

Actuators

- Actuators play a crucial role in the IoT by enabling devices to perform physical actions based on data received from sensors or commands from a central control system.

- Types of Actuators in IoT

1. Electric Actuators
2. Pneumatic Actuators
3. Hydraulic Actuators
4. Electromechanical Actuators

Q-B(A)

1. RFID

- Redio-frequency identification technology uses electromagnetic fields to automatically identify, and track tags attached to objects.

- An RFID system consists of three main components : a tag a reader, and an antenna.

- Here's breakdown of how it works:

Componets

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1. RFID Tag : Contains a microchip and an antenal. Tags can be passive or active.

2. RFID Reader : Emits radio waves and receives signals back from the RFID tag.

3. Antenna : Transmits the Radio waves between Signals back from the RFID Tag.

How it works :

1. The RFID Reader sends out a Radio signal via the antenna.
2. The RFID tag receives the signal and responds with its unique identifies
3. The Reader captures the tag's response and processes the information.

Applications

- Inventory Management
- Supply chain
- Access Control
- Healthcare
- Retail.