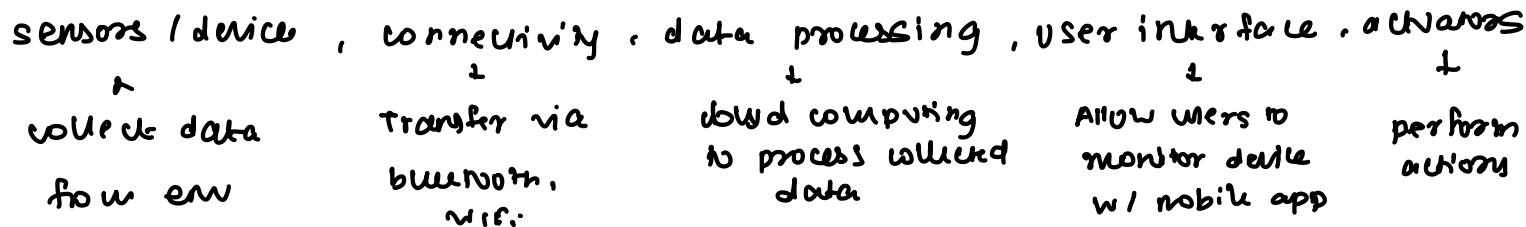


Basic Level Questions

1. What is IoT?

IoT is network of things embedded w/ sensor, software & connectivity to exchange data w/ other device or system.

2. What are the key components of an IoT system?



3. Give examples of real-life IoT applications.

Smart home, Healthcare, Agriculture, smart cities, Industry

4. What is the role of sensors in IoT?

Collect real time data, context awareness, automation.

5. What is the difference between IoT and M2M (Machine to Machine)?

IoT	M2M
• Broader	• point to point comm
• Internet based	• work over priv netw
• Data Anal & AI	• limited analytics
• Smart home	• ATM network comm

6. What are actuators, and how are they used in IoT?

Actuator - To action perform करते हैं; automated on sensor input

Types - motors, robotic arms

Actuator - IoT ke baad.

7. What communication protocols are used in IoT?

MQTT - light weight messaging (sensor)

CoAP - constrained devices

HTTP - web based (secure)

LoRaWAN - long range, low p

zigbee - Mesh networking (low power)

Bluetooth - short range

(wearable & mobile)

8. What is a smart device?

electronic device to network so connect kta now, it can be remotely controlled. performs tasks autonomously based on AI char- connectivity, automation capability, real time data processing, user interface.

9. What are the major challenges in IoT development?

sec & privacy, Interoperability, Power Management, scalability, network reliability, cost & complexity.

10. How does IoT impact everyday life?

smart home, healthcare, transportation, agriculture, Retail

🧠 Intermediate Level Questions

1. What is the architecture of an IoT system?

Perception Layer, Network Layer, Processing L, App Layer

2. Explain how MQTT works in IoT. lightweight, publish-subscribe, low bandw

Publisher - sends data

Broker - central server that route msg

subscriber - receives relevant data based on topic subscription.

3. What is the role of cloud computing in IoT?

Cloud - Data storage, Data processing & analytic, remote access integration with AI/ML.

Benefit - Scalability, security update, cost eff. Infra.

4. Describe the security risks in IoT and how to mitigate them.

unencrypted comm, weak auth, firmware vul, phy attack

Mitigation - TLS/SSL, strong auth, firmware update, network seg, IDS.

5. How does edge computing differ from cloud computing in the context of IoT?

edge - near data source, low latency, reduced bw, Industrial auth.

cloud - centralised data server, high due to transmission delay, high smart. data usage, more analytical.

6. What is interoperability in IoT, and why is it important?

ability of different IoT device, platform & protocol to communicate & work together.

Importance: Avoid vendor lock-in, large scale integration, improve user exp.

Challenge: Proprietary standards, inconsistent data format, lack of univ. Protocol

Solution: Standard API, middleware, IoT framework.

It ensure scalability & success of IoT.

7. What is the function of a gateway in an IoT network?

Gateway - connect sensor/device to the internet/cloud, handling data conversion & comm' protocol.

Function - Protocol translation, data aggregation, edge processing, security management.

Basically they act as a bridge

8. Describe the IoT stack (Perception layer, Network layer, Application layer).

Perception - data collection via sensors

network - data transmission

APPIN - Interface with users & services.

9. What are the typical power requirements of IoT devices?

It depends on:

Transmission frequency, sensor sampling rate, processing load

optimisation technique:

Duty cycling (sleep-wake), low power microcontroller, self harvesting (solar)

10. How is data collected, processed, and stored in an IoT system?

collection - sensor collects raw data

transmission - sent via protocol (MQTT, CoAP)

process - cloud/edge, use of AI/ML

stored - cloud/local, SQL/NoSQL

🚀 Advanced/Research-Level Questions

1. How can AI and machine learning be integrated into IoT systems?

edge AI - ML deployed on edge

Cloud-based AI - Data from device sent to cloud for AI usage

Data pre-processing - filter/clean the data

Pattern recognition - detect trends, anomalies

2. What is the role of blockchain in securing IoT?

device identity management - to avoid spoofing

secure data sharing - Tamper-proof logs

smart contract - Automation

decentralised trust - avoid reliance

3. Discuss scalability issues in IoT systems.

Device explosion - Billion device - enormous data

data management - Hard to manage

link congestion - too many simultaneous connections

Security - Hard to ensure auth & patching

Interoperability - Diverse renders

4. How can 5G enhance IoT applications?

- High speed & low latency - crucial for real time applications
- massive device connectivity - can support 1 million devices
- network slicing - allows customisation of bandwidth & latency
- edge enablement - bring compute closer to IoT device

5. What are Digital Twins and how are they related to IoT?

replica of physical objects

IoT + Digital twin = predictive maintenance

6. Explain LoRaWAN and its role in large-scale IoT networks.

Low power long range protocol & star topology

- cost effective, ideal for non-time critical & large scale systems.

7. What are the most commonly used platforms for IoT development?

Blynk

thingspeak

MIT app inventor

8. How does IoT contribute to Industry 4.0?

- predictive maintenance
- Asset tracking
- Quality control.
- Process automation

9. What are some data privacy concerns with IoT in smart homes?

- unauthorised Data access
- data sharing w/o consent
- weak encryption

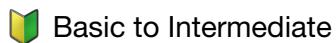
- surveillance

10. How can predictive maintenance be achieved using IoT?

- It predicts when equipment is about to fail

Data collection → Data analysis → Alert generation → maintenance

IoT in Smart Cities – Questions



1. What is a smart city and how does IoT enable it?

- real-time monitoring
- Automation
- Data driven governance

2. What are the key components of a smart city IoT infrastructure?

- sensor & device - CCTV
- communication - 5G, WiFi
- IoT gateway - Aggregate data
- Cloud/edge processing
- Data analytics
- smart apps

3. How is IoT used in smart traffic management?

- smart traffic light
- vehicle detection sensor
- smart parking
- public transport integration
- accident alert

4. How does IoT contribute to energy efficiency in smart cities?

- smart lights
- smart grid
- building automation
- renewable energy monitoring

5. What are smart grids and how do they work?

- smart meter - real-time consumption data
- grid sensor

• AI & pred analysis

• Two way comm

6. How can IoT help improve waste management in cities?

- smart bin
- recycling monitoring
- route optimisation
- waste analytics

7. What role does IoT play in public safety and surveillance?

- smart CCTV - facial recog
- gunshot detector
- disaster det
- emergency response

8. How does IoT contribute to smart water management?

- leak detection
- smart meter
- irrigation management
- water quality monitoring

9. What is a smart parking system and how does it function?

- sensor in parking spot
- data aggregation
- user app interaction
- automated access

10. What communication technologies are typically used in smart city deployments (e.g., LoRa, NB-IoT, Zigbee)?

Prot.	Range	Power	Use case
LoRa	long	low	env. monitoring
NB-IoT	l	v l	smart meter
Zigbee	med	l	home sys
WiFi	s	med	CCTV
5G	very l	high	High speed transp

🚀 Advanced/Discussion-Level

1. How does data integration work across various smart city systems?

- data collection
- data standardisation

- Centralised platform
- AI/ML analytics

2. What are the challenges in scaling smart city IoT infrastructure?

- device scarcity
- data overload
- Interoperability issues
- Security & privacy
- High initial cost
- Governance & policy gaps.

3. How can cities ensure privacy and data security in IoT systems?

- data encryption
- regular audit
- Access control
- edge processing
- data anonymisation

4. Discuss the use of digital twins in smart city planning.

- Urban planning
- Infra monitoring
- disaster management
- Energy management

5. What are the environmental impacts (positive or negative) of IoT in urban areas?

Positive

- energy eff
- reduced emission
- waste redn
- water conservation

Negative

- e-waste generation
- energy use of cloud center
- Radiation exposure

6. How can AI improve decision-making in smart city IoT applications?

- traffic pred
- anomaly detection
- pred. maintenance
- public safety
- resource optimisation

7. What are the policy and governance issues related to smart city IoT systems?

- data ownership
- vendor lock in
- legal compliance
- stakeholder coordination

• ethical data use

8. Compare centralized vs decentralized architectures in smart city networks.

	central	decentral
data scale	unreal server	each node
latency	high	lower
sec	easy	hard
fault T	single POF	more resilient

9. What are the ethical considerations of continuous data monitoring in public spaces?

- surveillance overreach - privacy invasion
- consent issues
- bias & discrimination
- misuse of data

10. How do smart cities address interoperability among heterogeneous IoT systems?

challenge

- diff manuf → diff API
- Date For & API inconsistent
mat

solution

- open standards
- middleware & API
- platform integration
- Gov. policies

💡 Industrial IoT (IIoT) – Questions

🔧 Basic to Intermediate

1. What is Industrial IoT and how does it differ from consumer IoT?

consumer IoT

use	smart home, watch
scale	small
reliability	med
sec	basic

industrial IoT.

factory automation, pred maintenance
large scale, enterprise level
mission critical, high
Advanced sec.

2. What are the common IIoT use cases in manufacturing?

- pred maintenance
- asset tracking
- energy optimisation
- process automation
- quality assurance

3. How is predictive maintenance achieved using IIoT?

data collection → edge processing → analytics → alerts & scheduling.

Benefit - extended lifespan, maintenance cost ↓, production halt ↓

4. What types of sensors are used in IIoT systems?

vibration, temperature, proximity, pressure, flow

5. What is condition-based monitoring?

Maintenance of machine only when necessary.

similar to pred. maintenance.

6. What role does edge computing play in IIoT?

- real-time processing
- reduced latency
- bandwidth optimisation
- enhanced security

⌚ Advanced/Discussion-Level

1. How does IIoT contribute to Industry 4.0?

- connectivity
- data-driven operation
- smart automation
- customization
- digital twin & simulation

2. How do cybersecurity concerns differ in IIoT compared to traditional IT?

	Traditional	IIoT
Asset Prot.	Data, software	phy sys & human safety critical
Avail	Imp.	rare
Patching	freq.	safety incident
Threat	Data breaches	

3. What are the challenges in retrofitting legacy systems with IIoT technologies?

- Incompatibility
- security vulnerability
- lack of documentation
- cost
- downtime

4. Explain the role of AI/ML in process optimization and anomaly detection in IIoT.

- process optimisation improves yield
- Anomaly detection early signs of failure predicted
- Quality assurance image based AJ.

5. What is the importance of real-time data analytics in industrial environments?

- Rapid decision making - reacts to faults
- production optimisation - dynamic adjustment
- safety monitoring - detect gas leaks
- predictive alerts - prevent failures

6. How is time-sensitive networking (TSN) important for IIoT? → IEC standards

- precise timing - sync in comm.
- low latency - critical for safety
- Reliability - guaranteed msg delivery
- collision avoidance - it supports merging control, data in one flow

7. How can IIoT improve supply chain visibility?

- Real time tracking
- UPS & RFID monitor goods location
- inventory management
- smart shelves automatically update
- condition monitoring Temperature, humidity
- Predictive logistics forecast delay & optimise routing