1. **What is IoT?**

IoT, stands for Internet of Things, is an advanced automation and analytics system which allows everyday things (embedded with sensors, electronic and software) to be connected via a network and share data, which then is processed using different technologies to deliver a complete system or service with no or minimal human interactions.

1. **What are the most important features of IoT?**

There are 7 key features of an IoT system:

* **Connectivity**: the ability to establish reliable and secure connections with high-speed and bi-directional data movements among IoT devices as well as between them and an IoT system hosted in a server or on a cloud platform
* **Analyzing**: the ability to process real-time collected data and exploit it to build a smart and effective business intelligence system
* **Integrating**: the ability to improve user experience by using a variety of models for more responsiveness and better decision making.
* **Artificial Intelligence**: the ability to complete tasks or make decisions automatically just by learning from given data but by being programmed explicitly to do so
* **Sensing**: the ability to detect and measure any changes in the physical environment surrounding the IoT system and report them.
* **Active** **Engagement**: connected systems, devices and services can engage actively with each other
* **Endpoint** **Management**: in this context, an endpoint can be understood as a physical computing device, which performs certain tasks as part of an IoT system. Endpoint management refers to the ability to discover, provision, deploy, update, and troubleshoot endpoint devices within an organization or a system

1. **Advantages and disadvantages of IoT?**

First, there are several advantages of IoT, but only the major ones will be listed hereafter:

* **Minimize human effort, time and money**: repetitive and scheduled tasks can be automated to save time and effort of manually doing them. On a micro scale, this includes automatic detection of stale food in the fridge or dimming the light to suit the mood of a romantic date. It also helps with time management by scheduling and automating repeated activities in one’s daily routine. On a grand scale, IoT can be the solution for improved surveillance security, or controlling the spread of epidemic by recording and tracking the history of contact of its users via phone GPS.
* **Enrich data collection**: connected devices with different sensors means that more data is generated. The performance of artificial intelligence (AI) models can be improved as there are more data (with presumably more features) to learn from. However, this may be a double-edged sword as an increase in data volume also requires more computational power for data cleaning and feature selection.
* **Improve the quality of interactions between human and technology devices**: devices embedded with voice recognition or gesture recognition technology can be controlled by human voice, which facilitates much better communication between users and their smart devices.

As good as it may sound, there are also some drawbacks of IoT:

* **Limited compatibility (for end users)**: to compete in the market, some IoT system providers design their products in a way that they form a closed ecosystem. A perfect example of this is Apple with their Apple Watch series, which can only be paired with an iPhone – another product of Apple. Users, thus, are limited to only the devices which are compatible with the ecosystem they are in
* **Complexity**: As the system grows in complexity, it is prone to failure or overloading. This requires more effort, time and funding for testing and mitigating system failure.
* **Privacy and Security**: data is transferred among several devices or services, which also means that they are more likely to be exposed to breaches.
* **Dependence**: the whole system depends on Internet (and some other wireless connection) to transfer data. If one of these connections is unstable or bottlenecked, it is likely that the system encounters errors or at least, real-time data update and processing is affected.

1. **List at least five typical sensors used in IoT**

They are temperature, humidity, light, ultrasound, and gyroscope. Some other sensors which are commonly found in wearables include GPS and ECG sensors.

1. **List some typical microcontrollers used in IoT? What is the difference between a microcontroller and microprocessor?**

Some common microcontrollers used in IoT are Arduino Uno R3, Raspberry Pi, Adafruit Flora.

The main difference between a microcontroller and a microprocessor is that microprocessor is usually a part of a microcontroller. It is a processing unit whose responsibility is performing logical operations. A microcontroller, on the other hand, contains not only a microprocessor but also other peripherals such as RAM and I/O ports.

1. **Define IoT ecosystem.**

An IoT ecosystem is an ecosystem which consists of all the devices which sense, process and analyze data and communicate with each other over the networks as well as the technology and software which utilize these components to function normally.

1. **Define the IoT technology stack.**

The IoT technology stack is generally made up of 5 layers, which are:

* **Device hardware**: the physical components of an IoT device such as sensors, a microcontroller and a battery, which facilitate collecting, processing and sharing data
* **Device software**: includes an interface (could be a graphical one to display the options to users or could be a voice recognition model which can understand and react to verbal commands from user) to interact with users as well as other computing algorithms and underlying services to process and share data collected by device hardware
* **Communications**: the exchange of data between device software and a cloud platform, which will then be shared further to other IoT devices or processed and stored in permanent storage for further analysis or exploitation.
* **Cloud platform**: the infrastructure which facilitates the computing and storing of data as well as deploying applications to connect, monitor and control remotely your IoT devices and services
* **Cloud application**: software programs which are hosted on a cloud platform and have the ability to interact with your IoT devices to deliver a complete service