

UNIT-1

Q.1. Explain the concept of 'Calm and Ambient Technology' with regards to IoT.

Ans -

1. **Definition:** Calm and Ambient Technology, linked with ubicomp or ambient computing, refers to systems that quietly operate in the background, ready to provide information when users choose to engage.
2. **The Ambiance:** "Ambient" signifies things not in our active focus, like background noise in recordings.
3. **Utility without Intrusion:** Calm technology aims to offer utility or info without competing for immediate attention.
4. **Challenges:** IoT proliferation brings challenges like configuration, power management, and human-device interaction.
5. **Networking Challenges:** Creating networks for many devices and managing interactions is technically challenging.
6. **User-Centered Issues:** Human factors and design are key in configuring and interacting with IoT devices.
7. **Design Importance:** Good design is vital for adoption and usability, considering the broader context.
8. **Contextual Design:** Devices should fit into their larger physical context.
9. **Attention Overload:** Too many notifications and pop-ups can overwhelm users.
10. **Engaging Attention:** Calm tech engages both central and peripheral attention.
11. **Enhanced Notifications:** Moving info from screens to the real world adds new dimensions to notifications.

OR

Keyword - MC SIP

M - Minimal Intrusion

C - Context Awareness

S - Subtle Feedbacks

I - Information demand

P - Predictive Capabilities

Q6] Explain concepts of calm and Ambient Technology with regards to IoT.

→ The concept of calm and Ambient technology in the context of IoT revolves around creating technology experiences that seamlessly integrate into our lives without being disruptive or demanding excessive attention.

The aim is to design IoT system and devices that provide useful information and services in a subtle, non-intrusive manner enhancing user experiences while maintaining a sense of calm & Ambience.

Here are key characteristics of calm & Ambient Technology in IoT:

1) Minimal Intrusion: Calm and Ambient IoT Technology operates in background, requiring minimal user interaction or explicit commands.

The devices are designed to proactively anticipate user needs and provide relevant information without requiring constant input

- 2) **Context Awareness** : Ambient IoT devices are aware of their surroundings and take context into account when providing information or performing actions. They can sense changes in environment or user behaviour and adjust their responses accordingly.
- 3) **Subtle feedback** : Rather than bombarding users with notification and alerts, calm and ambient IoT devices provide subtle and non-disruptive feedback. This could be through gentle visual cues, soft sounds or haptic feedback that blend harmoniously.
- 4) **Information demand** : Ambient IoT Technology offers information when it is needed without requiring explicit requests. Users can access relevant data effortlessly.
- 5) **Predictive capabilities** : Calm IoT system leverages machine learning and predictive algorithms to understand user preferences and habits, anticipating their needs and offering relevant assistance proactively.

Q.2. Explain the challenges faced by IOT designers in selecting enchanted devices.

Ans -

1. **Compatibility:** Ensuring that the chosen enchanted devices are compatible with the IoT platform and can communicate seamlessly.
2. **Security:** Managing the security of enchanted devices to prevent vulnerabilities and potential breaches in the IoT network.
3. **Scalability:** Ensuring that selected enchanted devices can scale as the IoT network expands without causing any performance issue.
4. **Power Efficiency:** Selecting enchanted devices that are power-efficient to prolong battery life or reduce energy consumption in IoT applications.
5. **Cost:** Ensuring that the cost of the enchanted devices aligns with the project budget while still delivering the required performance and functions.
6. **Interoperability:** Ensuring that enchanted devices from different manufacturers can work together without compatibility issues.
7. **Data Management:** Dealing with the influx of data generated by enchanted devices and implementing effective data management strategies.
8. **Updates and Maintenance:** Managing firmware updates and maintenance for a diverse range of enchanted devices in the IoT ecosystem.

Q.3. What are the key application areas of M2M communication. Discuss in detail.

Ans -

Machine-to-Machine (M2M) communication plays a crucial role in various industries and application areas where devices, sensors, and machines interact and exchange data without direct human intervention. Here are some key application areas of M2M communication:

1. Transportation and Fleet Management:

- M2M communication is extensively used in tracking and managing vehicles, such as trucks, buses, and delivery vans.
- It enables real-time monitoring of vehicle location, speed, fuel consumption, and maintenance needs.

2. Healthcare:

- In the healthcare sector, M2M is used for remote patient monitoring and telemedicine.
- Medical devices and sensors can transmit patient data, such as vital signs and health metrics, to healthcare providers, ensuring timely intervention .

3. Agriculture (Precision Agriculture):

- Precision agriculture relies on M2M technology to monitor soil conditions, weather, and crop health.
- Farmers can make data-driven decisions to optimize irrigation, fertilization, and pest control..

4. Environmental Monitoring:

- M2M helps monitor environmental conditions, such as air quality, water quality, and weather.
- This data is critical for disaster management, pollution control, and climate research.

5. Home Automation and Smart Buildings:

- In smart homes and buildings, M2M communication controls lighting, heating, ventilation, and security systems.
- It enhances energy efficiency, security, and user comfort.

6. Financial Services (ATMs and POS):

- M2M enables secure communication between automated teller machines (ATMs) and banking networks.
- It ensures smooth and secure financial transactions.

7. Connected Vehicles and Telematics:

- M2M plays a key role in automotive telematics, enabling vehicle tracking, remote diagnostics, and infotainment services.
- It enhances vehicle safety and provides valuable data for insurance companies.

Q.5. Explain the role of following stakeholders in IOT product development -

- **Painter**
- **Designer**
- **Architect**
- **Programmer**
- **Hacker**
- **Engineer**

Answer :

Painter: The painter is responsible for the visual appearance of the IoT product. They work on the product's aesthetics, including colors, textures, and design elements, to make it visually appealing.

Designer: Designers focus on the overall user experience (UX) and user interface (UI) design of the IoT product. They ensure that the product is easy to use and visually pleasing.

Architect: Architects design the overall structure and framework of the IoT product. They plan how different components and devices will work together to achieve the desired functionality.

Programmer: Programmers write the code that makes the IoT product function. They turn the design and architecture into a working software or firmware that runs on IoT devices.

Hacker: In a legitimate context, a hacker can be a security expert hired to identify and fix vulnerabilities in the IoT product. They help ensure the product is secure from cyber threats.

Engineer: Engineers work on the physical aspects of the IoT product, such as hardware components and connections. They make sure the devices can collect and transmit data reliably.

Q.6. FIRST-CLASS CITIZENS ON THE INTERNET:

Ans -

1. Meaning: "First-class citizens on the Internet" means that devices and technologies should follow the same rules as everyone else on the Internet.

2. Use Standard Rules: When possible, use the same Internet rules and conventions that everyone else is using.

3. IP Everywhere: For the past 20 years or so, we've generally expected the Internet Protocol (IP) to work everywhere, and we think this will continue in the Internet of Things.

4. Open Standards for Problems: In cases where the usual rules don't work, like with really low-powered sensors, it's better to make new open rules to solve the problem.

5. Example with Mobile Phones: When mobile phones were first connected to the Internet, it was hard for them to talk to websites directly, so we made a whole set of new rules called Wireless Application Protocol (WAP) to help them do that.

Q.7. Write a note on privacy of data in iot applications.

Answer:

Q.8 Magic as Metaphor?

Answer:

- People / society should be ready to accept the technology.
- In many cases, the key difference between a technology that failed and one that became hugely successful is timing. Successful technologies often arrive a few years later when people are more ready and open to what they have to offer.
- Technology blogger Venkatesh Rao came up with a good term to help explain how new technology becomes adopted.
- He said The changes in the current world are not noticed in the present, but if we step in the past, then we may notice the changes.
- Rao called this concept the **manufactured normalcy** (situation in which everything is normal) field.
- For a technology to be adopted, it has to make its way inside the manufactured normalcy field.
- Take the example of the mobile phone, which was initially introduced as a phone you could use anywhere, not just in one place.
- Now broadly the same technology is used to provide a portable Internet terminal, which can play movies, carry your entire music collection, and (every now and then) make phone calls.
- The way that portable Internet terminals made it into our manufactured normalcy field was through the **phone metaphor**.

Q.9. What is graceful degradation? Also explain affordance with respect to technology.

Graceful degradation : It is a concept in technology and design that refers to the ability of a system or product to maintain a basic level of functionality even when some of its components or features fail or become unavailable. This approach ensures that if there are problems or limitations, the system can still perform essential functions. Graceful degradation is often contrasted with "catastrophic failure," where the system completely breaks down when faced with any issue.

Here are some key points about graceful degradation:

Robustness: It enhances the robustness and reliability of a system by allowing it to continue functioning to some extent, even under adverse(failed) conditions.

User Experience: It aims to provide a better user experience by minimizing disruptions and ensuring that users can still accomplish their most critical tasks.

Examples: In web design, if certain scripts or features fail to load, a gracefully degrading website will still display content and core functionality. Similarly, in transportation systems, if a train's air conditioning breaks down, the train can still operate safely, albeit less comfortably.

AFFORDANCES:

Donald Norman defines affordances as follows:

- Affordances provide strong clues to the operations of things.like..
 - Knobs are for turning.
 - Balls are for throwing or bouncing.
- When affordances are taken advantage of, the user knows what to do just by looking:
- no picture, label, or instruction is required.
- Complex things may require explanation, but simple things should not.
- When simple things need pictures, labels, or instructions, the design has failed.
- Users who don't realise that a device has any extra capabilities should still be able to use it as if it hasn't.
- Similar rules apply when designing physical interfaces.
- Don't overload familiar connectors with unfamiliar behaviours.

Unit 2

Sketching IMP

Q.1 .Explain how dynamic ip address allocation helps in iot development?

1. Thankfully, we don't typically have to choose an IP address for every device we connect to a network.
2. Instead, when you connect a laptop, a printer, it can request an IP address from the network itself using the Dynamic Host Configuration Protocol (DHCP).
3. When the device attempts to establish a connection, it doesn't rely on its internal configuration to determine its address; instead, it sends a request to the router, asking for an address assignment.
4. The router assigns it an address.
5. This is not a static IP address which belongs to the device indefinitely; rather, it is a temporary "lease" which is selected dynamically according to which addresses are currently available.
6. If the router is rebooted, the lease expires, or the device is switched off, some other device may end up with that IP address.
7. Using a static address may be fine for development (if you are the only person connected to it with that address), but for working in groups or preparing a device to be distributed to other people on arbitrary networks, you almost certainly want a dynamic IP address.

Q.2. why should the process of prototyping start with sketching? How is using breadboard cost saving in building a prototype from a sketch?

Ans -

Starting with Sketching:

(VICPC)

1. Visualization: Sketching helps designers see and conceptualize ideas quickly.

2. Iteration: Easy changes and refinements make sketching ideal for rapid iteration.

3. Communication: Sketches serve as a common visual language for cross-functional teams. They facilitate communication between designers, engineers, stakeholders, and clients by conveying design concepts in a universally understandable format

4. Problem-Solving: Identifying design flaws and challenges early in the process reduces risk.

5. Cost-Efficiency: Sketching is low-cost and reduces financial risk.

Using Breadboard in Prototyping:

1. Cost Savings: Breadboarding is a cost-effective way to create functional prototypes of electronic devices. It allows developers to experiment with different components and circuit designs without the need for custom PCB (Printed Circuit Board) fabrication, which can be expensive.

2. Rapid Prototyping: Breadboards enable rapid prototyping of electronic circuits. Components can be easily plugged in and rearranged, speeding up the development process.

3. Error Identification: Detect and fix errors before costly final designs.

4. Flexibility: Breadboards are reusable, so components can be removed and reused for different prototypes, saving on component costs.

5. User Testing: Functional prototypes can be used in user testing and feedback.

6. Education: Breadboarding is an educational tool for hands-on learning.

Q.3. What are the challenges when we move from prototype to mass production? Explain.

Ans -

1. **Design Adaptation:** Modifying the design for efficient mass production.
2. **Quality Consistency:** Ensuring product quality remains consistent across large production volumes is a major challenge.
3. **Supply Chain Complexity:** Managing materials and suppliers effectively.
4. **Cost Control:** Keeping production costs within budget while maintaining quality is a critical challenge.
5. **Capacity Planning:** Accurately estimating production capacity and scalability to meet market demand is a challenge.
6. **Automation:** Implementing automated testing and quality control processes is essential for efficiency and consistency.

7. **Waste Reduction:** Minimizing waste and ensuring sustainability are challenging in mass production.
8. **Market Demand:** Handling demand variations.
9. **IP Protection:** Protecting intellectual property and preventing counterfeiting.

Q.4. Explain below terms :

IP, TCP, UDP, DNS, Static IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports,

Ans:

1. IP (Internet Protocol): IP is a set of rules that govern how data packets should be sent, received, and routed across networks, including the internet. It **assigns unique IP addresses** to devices for identification and communication.

2. TCP (Transmission Control Protocol): TCP is a reliable and **connection-oriented** protocol used for **data transmission**. It ensures that data sent from one device reaches the destination in the correct order.

3. UDP (User Datagram Protocol): UDP is a lightweight and **connectionless** protocol used for data transmission. It **doesn't guarantee delivery or order of data packets**, making it faster but less reliable than TCP.

4. DNS (Domain Name System): DNS is a system that translates human-readable **domain names** (e.g., www.example.com) into **IP addresses** (e.g., 192.168.1.1), allowing users to access websites and services using names instead of numerical IP addresses.

5. Static IP Address Assignment: Static IP addressing involves **manually** assigning a specific, unchanging IP address to a device. It's used when a consistent address is needed for services like servers or networked devices.

6. IPv6 (Internet Protocol version 6): IPv6 is the **latest version** of the Internet Protocol, designed to replace IPv4. It provides a larger address space, ensuring sufficient unique IP addresses for all devices on the internet.

7. MAC Addresses (Media Access Control Addresses) : MAC addresses are unique identifiers assigned to network interface cards (NICs) and used to identify devices on a local network. They are assigned by manufacturers and are typically fixed.

8. TCP and UDP Ports: Ports are like **virtual doors** used to differentiate between **multiple network services** running on a single device. TCP and UDP use port numbers to route data to the appropriate service. For example, port 80 is commonly used for HTTP (web) traffic, while port 53 is used for DNS.

Q.5. Compare open source and closed source approaches of making a prototype.

Ans -

Comparing open source and closed source approaches for making a prototype involves examining the key differences in terms of access, flexibility, development resources, and community involvement:

Open Source Prototype:

1. **Access to Source Code:** In open source, the source code and design files are freely accessible to the public. Anyone can view, modify, and contribute to the project.
2. **Flexibility:** Open source prototypes offer high flexibility, allowing developers to customize and adapt the design and code to specific needs and requirements.
3. **Community Collaboration:** Open source projects often benefit from a collaborative community of developers and enthusiasts who contribute ideas, improvements, and bug fixes.
4. **Cost-Efficiency:** Open source prototypes are typically cost-effective because they eliminate licensing fees and reduce development expenses.
5. **Transparency:** The transparent nature of open source build trust and allows for careful code inspection and security reviews.

Closed Source Prototype:

1. **Intellectual Property Protection:** Closed source prototypes prioritize intellectual property protection. The source code and design details are typically proprietary and not openly shared.
2. **Controlled Development:** Closed source prototypes provide more control over the development process, allowing companies to protect proprietary technology and maintain a competitive edge.
3. **Resource Investment:** Developing closed source prototypes may require more significant resource investment, including research and development costs and potential licensing fees.
4. **Limited Customization:** Closed source prototypes may offer limited customization options, as the source code is not openly accessible for modification.
5. **Limited Community Input:** Closed source projects may have a smaller development team and limited community involvement, which can reduce the diversity of ideas and expertise.
6. **Protection Against Copying:** Closed source prototypes aim to prevent unauthorized copying and replication of technology or products.

Unit 4

Q.1. Define business model. List the factors involved in study of business model?

Ans - A business model is a comprehensive framework that outlines how a company creates, delivers, and captures value. It describes the core aspects of a business, including its products or services, target customers, revenue generation, cost structure, and overall strategy for sustainable growth and profitability.

The business model definition brings together a number of factors:

- A group of people(customers).
- The need of those customers.
- A thing that your business can do to meet those needs.
- A success criterion such as making a profit.
- Organizational practices that help to achieve this goal:
- Determine the sources of revenue, including pricing strategies, sales channels, and customer payment methods.
- And to be able to carry on doing so, sustainably.
- Identify the critical assets, technology, partnerships, and resources required to deliver the value proposition.

Q.2. Describe the performance and battery life.

Ans -

1. Performance and battery life are often interlinked in technology.
2. Improvements in one aspect can positively or negatively impact the other.
3. A device which stays in one place and powered by an AC adaptor plugged into the wall isn't as reliant on energy conservation.

- Q.3. Write a short note on business model canvas.(IMP)**

The Business Model Canvas		Designed for:	Designed by:	Date:	Version:
Key Partners Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform? <u>Intermediaries and Suppliers</u> Distribution channels Suppliers of raw materials Providers of specialized resources and activities	Key Activities What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?	Value Propositions What value do we deliver to the customer? Which one of our customers' problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?	Customer Relationships What types of relationships does each of our Customers expect us to establish? Which ones have we established? How are they interacting with the rest of our business model? How costly are they?	Customer Segments For whom are we creating value? Who are our most important customers?	
					Key Resources What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?
Cost Structure What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive?		Revenue Streams For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?			

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2. The canvas is a Creative Commons–licensed single-page planner. The boxes are designed to be a good size for sticky notes, emphasizing that you can play with the ideas you have and move them around.
3. Also the layout gives a **meaning and context** to each item.
4. At the bottom right, we have Revenue Streams, which is more or less the question of “how are you going to make money?”
5. The central box, Value Propositions, is, in plainer terms, what you will be producing—that is, your Internet of Things product, service, or platform .
6. The Customer Segments are the people you plan to deliver the product to.
7. The Customer Relationships might involve a lasting communication between the company and its most passionate customers via social media.
8. Channels are ways of reaching the customer segments.
9. The Key Activities are the things that need to be done. The Thing needs to be manufactured; the code needs to be written.
10. Key Resources include the raw materials that you need to create the product but also the people who will help build it.
11. You will need Key Partners, businesses that are better placed to supply specific skills or resources, because that is their business model, and they are geared up to do it more cheaply or better than you could do yourself.
12. The Cost Structure requires you to put a price on the resources and activities you just defined.

Q.4 Define Memory Management. List and explain the types of Memory.

Ans -

1. When you don't have a lot of memory to play with, you need to be careful as to how you use it.
2. The computer user was presented with too many “low memory” pops up warning dialog boxes.
3. An embedded platform with no screen or other indicators will usually continue blindly until it runs out of memory completely.
4. They might suddenly stop working when they run out of memory without warning.
5. Even while you are developing software for a constrained device, trying to debug these issues can be difficult.

The different types of memory you might encounter are:

ROM

ROM (Read-Only Memory):

- ROM is memory where information is permanently coded during its creation.
- It's inflexible and typically stores only unchanging data like the program code.

Flash Memory:

- Flash is a semi-permanent memory that retains information without power.
- Reading from flash is fast, similar to ROM or RAM.

RAM (Random-Access Memory):

- RAM is fast but volatile memory, meaning it needs power to retain data.
- It's used as working memory for temporary storage during processing tasks.

Q.5 Give the difference between Stack and Heap.

Ans -

Stack	Heap
Stack provides static memory allocation, i.e., it is used to store the temporary variables.	Heap provides dynamic memory allocation. By default, all the global variables are stored in the heap.
It is a linear data structure means that elements are stored in the linear manner, i.e., one data after another.	It is hierarchical data structure means that the elements are stored in the form of tree.
It is used to access the local variables.	It is used to access the global variables by default.
The size of the stack memory is limited which is dependent on the OS.	The size of the memory is not limited.
As it is a linear data structure, so data is stored in the contiguous blocks.	As it is hierarchical data structure, so elements are stored in the random manner.
In stack, the allocation and deallocation are automatically managed.	In heap, the memory is manually managed.
The implementation of stack can be done in three forms using array, linked list and dynamic memory.	The implementation of heap can be done in two forms using arrays and trees.
The size of the stack memory is decided by the operating system.	The size of the heap memory is decided by the programmers.

Q.6. What is Government Funding and Crowdfunding? Explain both.

Ans -

Government Funding:

1. Government Support: Governments aim to boost industry and technology development in their countries by providing financial support.
2. Funding Management: Governments may manage their funds differently than traditional venture capital.
3. Spending Constraints: Certain funding may have spending constraints, like allocating funds for business consultancy or web development.
4. Policy Alignment: Governments distribute funds based on policy objectives, favoring research grants over market entry grants.
5. Multiple Funding Sources: Companies often secure funding from various sources to meet their needs.

Crowdfunding:

1. Crowdfunding represents a decentralized approach to funding projects by involving many contributors.
2. Platforms like Kickstarter and Indiegogo enable creators to raise funds from a global audience.
3. Presentation Matters: Appealing text, slick videos, and great design may make the difference between yours and a competing project.
4. crowdfunders may be more likely to fund projects in which they see some attention to the business model or a track record for successful completion by the project team.
5. Customer Engagement: Crowdsourcing allows creators to know the customer interest in your product and receive valuable feedback.
6. Successful crowdfunding campaigns can go viral, indicating a potentially successful product.

Unit 5

Q.1. How to design a PCB (Printed Circuit Board)? List and explain the software choices for designing a PCB.

Ans -

Design PCB :

1. Soldering is a good step towards making your prototype more robust.
2. After you've done this, you should have something that will survive being given to an end user.
3. You will soon get fed up with soldering each item by hand.
4. Designing and making your custom PCBs offer more layout options and easier soldering.
5. Homemade boards will still lack that fully professional finish. That's because they won't have the green solder mask or silkscreen layers that a PCB manufacturer will give you.
6. Moving to professionally manufactured boards further simplifies the assembly process because the solder mask will make the soldering a bit easier, and, more importantly, the silkscreen provides outlines of where each component should be placed.

Software Options :

- There are various software options for PCB design, ranging from professional tools like Altium Designer to beginner-friendly ones like Fritzing.
- Fritzing is a free, beginner-focused, open-source software that starts with a breadboard-style design and converts it into a PCB.
- **KiCad**, another open-source option, offers a more traditional approach with a broader library of parts and support for up to 16 copper layers.
- **EAGLE by CadSoft** is a popular choice for hobbyists, offering a free version for non-commercial use, but with some limitations on layers and board size.
- **DesignSpark PCB** is a recent competitor to EAGLE, offering more flexibility in terms of board size and layers but not available for Linux or Mac.

Q.2. List and explain the manufacturing PCB.

Ans -

If you want only a couple of boards, or you would like to test a couple of boards (a very wise move) before ordering a few hundred or a few thousand, you may decide to make them in-house.

ETCHING BOARDS

- The most common PCB-making technique for home use is to etch the board.
- **DIY Option:** For small quantities or testing, you can etch PCBs at home using kits. Begin by transferring your PCB design to the board, often through a UV-exposed stencil. Subsequently, immerse the board in an etching solution to remove excess copper and expose the tracks. After cleaning, it's almost ready for use.
- **Photo-Resist Technique:** When using photo-resist boards, expose them to a bright lamp for a few minutes before etching.
- **Final Step:** The last step is to drill the holes for any mounting points or through-hole components.

Milling Board :

1. using a CNC mill to drill the holes in your PCB, you can also use it to route out the copper from around the tracks themselves.
2. To do this, you need to export the copper layers from your PCB software as Gerber files.
3. To translate your Gerber file into the G-code that your mill needs requires another piece of software.
4. Some CNC mills come with that software already provided, or you can use a third-party program such as Line Grinder.
5. The mill effectively cuts a path round the perimeter of each track to isolate it from the rest of the copper.
6. As a result, PCBs which have been milled look a bit different from those which are etched because any large areas of copper that aren't connected to anything are left on the board.

Third-Party Manufacturing:

1. Companies offer PCB manufacturing services, ideal for complex designs or when you prefer not to produce PCBs yourself.
2. Prices for third-party manufacturing depend on design complexity and the manufacturer.
3. If you need the boards quickly, a local firm is best.
4. If you have more time you can give it outside country such as china, it might reduce cost.
5. To utilize third-party manufacturing, you need to provide Gerber files, including all relevant layers such as copper, solder mask, silkscreen, and drill files.

Q.3. Explain use of the Internet of Things as part of the solution.

Ans -

1.Remote Monitoring: IoT allows for remote monitoring of devices and systems in real-time, providing updates and data from anywhere with an internet connection.

2.Data Collection: IoT sensors collect a wealth of data, such as temperature, humidity, and usage patterns, which can be used for analysis and decision-making.

3.Automation: IoT enables automation of various processes and tasks based on data inputs, reducing manual intervention and improving efficiency.

4.Predictive Maintenance: By analyzing IoT data, maintenance needs can be predicted, helping to prevent costly equipment breakdowns.

5.Energy Efficiency: IoT can optimize energy usage by adjusting systems like heating, cooling, and lighting based on occupancy and environmental conditions.

6.Enhanced Security: IoT devices can enhance security through features like surveillance cameras, access control, and intrusion detection.

7.Healthcare Monitoring: In healthcare, IoT devices can monitor patient health remotely, providing early warnings and improving patient care.

Q.4. Explain the foll terms :

- 1. Privacy**
- 2. Control**
- 3. Disrupting control**
- 4. Crowdsourcing**

Ans -

Privacy: Privacy in IoT refers to an individual's right to control their personal information and data in the context of connected devices. It involves safeguarding sensitive data from unauthorized access, ensuring users have control over what data is collected, and being transparent about data collection and usage practices.

Control: In IoT, control means the ability of users to manage and operate connected devices, including setting preferences, granting or revoking access permissions, and defining how data is shared. Users should have control over their devices and data to ensure their security.

Disrupting Control: Disrupting control in the context of IoT ethics refers to situations where malicious actors or security breaches take control away from legitimate users. This can lead to unauthorized access, data breaches, or manipulation of devices, posing significant risks to individuals and organizations.

Crowdsourcing: Crowdsourcing in IoT ethics involves gathering input, ideas, or contributions from a large group of people, often via online platforms. It can be used to enhance the development, monitoring, or improvement of IoT solutions by leveraging the collective intelligence and expertise of a diverse community of participants. However, it also raises ethical considerations regarding data privacy and consent when involving user-generated data.