

# Unit 05

## Applications of Computer Science

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### Multiple-choice questions (MCQs)

MCQ	1	2	3	4	5	6	7	8	9	10
	B	C	B	D	D	A	C	A	D	C

### Short Response Questions (SRQs)

#### Q1. How IoT can enhance our daily life?

##### Internet of Things (IoT)

- IoT can enhance our daily life by connecting smart devices to the Internet.
- It allows us to control things like home appliances and other smart devices from our phones.
- It makes life more easy, efficient and safe.
- For example, you can get a message on your phone if security camera detects some strange activity at your home or office.

#### Q2. Provide three examples of WSNs used in IoT systems.

##### Wireless Sensor Networks (WSNs)

Some examples of WSNs used in IoT systems are the following.

- Surveillance systems
- Weather monitoring systems
- Structural health monitoring systems
- Smart grid electricity network

#### Q3. Differentiate between public cloud model and private cloud model.

##### Public Cloud Model vs. Private Cloud Model

- Public cloud model is available to everyone whereas private cloud is used by only one organization.
- Public cloud is less expensive than private cloud model.
- Public cloud is managed by a third party whereas private cloud is managed by the organization itself or by a third party.

#### Q4. What is Blockchain? Why data stored in a Blockchain is secure?

##### Blockchain

- Blockchain is a digital database of transactions which is shared and maintained by network users.
- The data stored in a blockchain is **secure** because it is stored across the network of computers around the world.

- Blockchain uses strong cryptography techniques to ensure security of data from hackers and other cyber threats.

### Q5. Why integration of Blockchain and IoT is beneficial?

#### Integration of Blockchain and IoT

- The integration of blockchain and IoT increases security, performance and reliability of IoT networks.
- It provides faster and efficient communication between the devices.
- It provides security and connectivity in several areas such as supply chain, energy grid, healthcare, agriculture and water management.

### Q6. Define permissioned blockchain network.

#### Permissioned Blockchain Network

- It is generally setup by organizations who have built a private blockchain network.
- It allows only authorized individuals to access and perform transactions.
- If someone wants to join the network then he needs permission.
- It is safe, secure and transparent network.

## Long Response Questions (LRQs)

### Q1. What is blockchain technology? Describe in detail how transactions are processed using blockchain technology.

#### Blockchain Technology

Blockchain is a digital database of transactions which is shared and maintained by network users. The information is stored at a single centralized location.

- The information is grouped together in **blocks** and the blocks are linked together in a **chain**.
- Each block in the chain contains information from the previous block.



#### Transactions Processed on the Networks

Blockchain technology enables people to make transactions directly with each other without the involving banks or other organizations. Each transaction is verified by the participants in a peer-to-peer network.

- When a deal is made between two participants, the transaction is permanent. It is added to the ledger and cannot be reversed.
- Blockchain provides faster transactions than traditional databases without involving third parties.
- Blockchain uses **decentralization** of data. The data is stored in millions of computers all over the world that are connected to blockchain.

## Q2. Briefly explain the role of following technologies that enabled IoT.

- **Cloud Computing**
- **Communication Protocols**
- **Embedded Systems**

### 1. Cloud Computing

Cloud computing is an IT infrastructure that provides data storage, databases, servers, networking and application software services over the Internet. There are four types of cloud computing models.

#### Public Cloud

In this cloud, the resources are owned and operated by a cloud service provider.

#### Private Cloud

This cloud computing model runs on a private network which is used inside a single organization.

#### Community Cloud

Community cloud model is a cloud infrastructure that provides access and services to many organizations to share information.

#### Hybrid Cloud

It is a combination of public and private cloud.

### 2. Communication Protocols

IoT communication protocol is a set of rules that govern how data is transferred and understood between physical devices, sensors and end users.

- Protocols provide exchange of information and methods of connection between IoT devices and end users.
- It is required for proper use of IoT enabled devices.

### 3. Embedded Systems

Embedded systems are small electronic devices with hardware and firmware. **Firmware** is a software that is permanently installed in a device or electronic machine.

- They have a microcontroller or microprocessor that controls operations of embedded systems.
- They have various applications in IoT such as they can monitor a room temperature and automatically adjust the thermostat.

**Q3. Criticize the negative impacts of AI systems in the domain of education and learning of students.****Negative Impacts of AI Systems**

Some negative impacts of AI systems are the following.

**No creativity and Emotions**

AI systems do not have emotions and creativity. They make decisions based on the algorithms and given data. On the other hand, human activity is based on the experience, emotions and creativity. Therefore, AI systems cannot think like humans.

**Unemployment**

Robots are used in many industries to replace humans. It may result in increased unemployment. For example, robots are used in manufacturing factories to assemble different parts of cars.

**No Ethics and Morality**

AI systems do not have ethics and morality. They lack personal values and consciousness. They operate based on algorithms and data without any natural understanding of right and wrong.

**High Cost**

The cost of creating AI systems is very high. It requires a lot of time, resources, latest hardware and software.

**Privacy Concerns**

AI systems often need to collect and analyze large amounts of data that can raise significant privacy concerns. Protecting user data and ensuring privacy are crucial to prevent misuse and unauthorized access.

**Q4. Examine the reasons behind the conflicting requirements among stakeholders during the development of AI systems.****Conflicting Requirements of Stakeholders in AI Systems**

Normally stakeholders may have conflicting requirements during the development of AI systems. It is very difficult for the developers to satisfy everyone. AI developers have to manage these conflicting requirements that may lead to the failure of software project.

Some of the reasons behind the conflicting requirements among stakeholders are the following.

**Diverse Expectations**

Different stakeholders have different interests and goals. For example, business stakeholders are interested in the profits and efficiency of the product. However, the end user may need the reliable and easy to use AI systems.

### Privacy and Security

The AI systems may need to collect, store and process data. The user may be concerned about how AI systems will collect, store and use personal data. They may require strict rules to protect data privacy.

### Cost and Time

The clients often want a cost-effective AI system that is developed with a certain timeframe. An AI system that meets all requirements of high accuracy can be expensive.

### Lack of Understanding

Conflicts may be due to different interpretation or understanding of the given problem. As you know, every stakeholder has different level of education, skills and background.

### Way of Implementation

Different stakeholders may have similar needs but may differ on how to implement them. For example, business persons are more interested in speedy work so that it can be marketed quickly while developers focus on the technical accuracy of the product.

**Q5. Consider creating a cutting-edge system for language learning. The priorities of teachers, learners and programmers will all differ. How would it help to make the new language learning system better by incorporating the varying priorities? How can AI be added to it?**

### Cutting-edge System For Language Learning

Cutting-edge system for language learning will help to make the new language learning system better by adding the varying priorities. AI can be added in the following in the system.

#### Curriculum Design (Teachers' Perspective)

Teachers ensure the system covers essential language skills. Their input balances theory and practice in lessons.

#### Personalized Learning (Learners' Perspective)

Learners want content tailored to their pace and style. AI adapts lessons based on individual progress.

#### Usability (Programmers' Perspective)

Programmers focus on creating an intuitive, responsive system. Their work ensures smooth performance across devices.

#### AI-Driven Features

AI offers real-time feedback on pronunciation and grammar. Conversational AI simulates real-world scenarios for practice.

#### Analytics (Teacher Support)

AI provides insights into student progress. Teachers use data to tailor lessons and offer personalized support.