

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

Unit

6

Emerging Technologies

Q.1. What are Emerging Technologies? Explain any eight emerging technologies in detail with examples.

Ans. Emerging technologies are new systems, tools, or techniques that are either in development or recently introduced. These technologies can bring big improvements in our daily life, education, business, and healthcare.

Importance of Emerging Technologies:

1. Make Work Easier and Faster:

Emerging technologies help complete tasks quickly and with less effort.

2. Improve Education:

They support modern learning methods through smart classrooms and online resources.

3. Enhance Healthcare:

Advanced machines and systems improve patient care and help in quick diagnosis and treatment.

4. Increase Industrial Growth:

New technologies improve production, reduce costs, and increase efficiency in factories.

5. Add Comfort to Daily Life:

Smart devices and automation make everyday tasks more convenient.

6. Create Job Opportunities:

New fields and careers are being created through technological development.

7. Solve Modern Problems:

Technologies like AI and biotechnology help solve problems like climate change, diseases, and food shortage.

8. Build a Better Future:

By using emerging technologies, society can become more advanced, connected, and successful.

The following are eight important emerging technologies:

1. Artificial Intelligence (AI):

Definition: Artificial Intelligence is a technology that enables machines or software to think and act like human beings.

Use: AI is used to recognize speech, identify faces, and make smart decisions without human help.

Example: Siri and Google Assistant are AI-based tools. Self-driving cars also use AI to follow traffic rules and avoid accidents.

2. Cloud Computing:

Definition: Cloud computing allows users to store and access data and software over the internet instead of using personal computers or hard drives.

Use: It helps people work together from different places and saves the cost of expensive hardware.

Example: Google Drive and Dropbox allow users to save files online and open them from anywhere.

3. Blockchain:

Definition: Blockchain is a secure way to record and share information across many computers, making it difficult to change or hack the data.

Use: It is used to keep digital records safe. It is usually used in digital currencies and contracts.

Example:

Bitcoin works with blockchain. It is also used to track products in supply chains.

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4. Internet of Things (IoT):

Definition: IoT connects everyday objects like cars, lights, or appliances to the internet so they can send and receive data.

Use: It helps make homes, workplaces, and cities smarter by automating daily tasks.

Example: A smart watch that checks your heart rate or a smart fridge that tells you when you need milk.

5. Augmented Reality (AR) and Virtual Reality (VR):

Definition: AR adds digital elements to the real-world using devices like phones or glasses. VR creates a completely virtual environment using special headsets.

Use: These technologies are used in education, video games, and professional training.

Example: AR is used in Pokémon Go. VR is used in flight training and medical simulations.

6. 5G Technology:

Definition: 5G is the fifth generation of mobile network technology. It provides faster internet speed and better connectivity.

Use: It supports high-speed internet for smartphones, smart devices, and real-time communication.

Example: 5G improves video calls, online games, and supports advanced uses like smart cities and self-driving cars.

7. Quantum Computing:

Definition: Quantum computing is a new type of computing that uses units called **qubits**. These qubits can hold more information than normal computer bits.

Use: It helps solve complex problems quickly in fields like science, medicine, and weather prediction.

Example: Quantum computers are used in drug discovery and climate modeling.

8. Biotechnology

Definition: Biotechnology uses living organisms, like plants and bacteria, to create useful products or solve problems.

Use: It is used in making medicines, improving crops, and producing environment-friendly materials.

Example: Biotechnology is used to make vaccines and genetically modified crops.

Q.2. What is Cloud Computing? Explain its basic concepts in detail.

Ans. Cloud computing is a technology that allows users access storage, servers, and applications over the internet without owning or managing hardware. Users pay only for what they use.

Importance of Cloud Computing:

1. It saves time by providing quick access to resources.
2. It reduces costs as users don't need to buy expensive equipment.
3. It increases efficiency through virtualization and scalability.
4. It offers flexibility to work from anywhere.
5. It supports business growth by adjusting resources easily.
6. It enables new technologies like AI and IoT.

Basic Concepts of Cloud Computing:

Cloud computing is based on some key concepts that help users get the most benefit from it. These include:

1. Virtualization:

Definition: Virtualization is a technology that allows one physical computer to act like many computers. It creates multiple "virtual machines" on a single machine.

Explanation: Each virtual machine can run its own operating system and software separately. This helps use the full power of one physical computer without needing many actual machines.

Example: One powerful computer can be divided into several virtual systems, each used for different tasks by different people.

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2. Scalability and Elasticity:

Definition: **Scalability** means the ability to increase computing resources such as servers, storage, or processing power **when needed**, without affecting the **performance** of the system or network. **Elasticity** means the ability to **quickly increase or decrease** computing resources, like servers or storage, according to the current demand.

Explanation: These features help businesses and users handle more work when needed without slowing down their services.

Example: During special sale days like Eid or Independence Day, online stores can increase their server power to manage more customers.

3. On-Demand Access

Definition: On-demand access means using computing services whenever needed without delay.

Explanation: Users can quickly get more storage or computing power without long setup times.

Example: If a student needs more storage for a project, they can immediately get it from the cloud without buying a new device.

Q.3. Classify the various types of cloud services and compare them, highlighting key distinctions.

Ans. Cloud computing provides services that allows people and businesses use technology over the internet without owning hardware. The main types are **Infrastructure as a Service (IaaS)**, **Platform as a Service (PaaS)**, and **Software as a Service (SaaS)**. Each type offers different features and levels of control.

1. Infrastructure as a Service (IaaS):

Definition: IaaS is a cloud service that provides basic computing resources like servers, storage, and networking over the internet. Users rent these resources and control the software and data, but the physical machines are managed by the provider.

Use: It is used by businesses and IT professionals who want to build their own systems without buying expensive hardware. It helps in running websites, storing large amounts of data, and managing applications.

Example: Amazon Web Services (AWS) offers virtual servers that users can rent to run their applications. Other examples are Microsoft Azure and Google Compute Engine.

2. Platform as a Service (PaaS):

Definition: PaaS is a cloud service that provides a complete platform for developers to build, test, and deploy applications. It includes servers, storage, and tools needed for development, so users do not worry about managing hardware or software.

Use: It helps software developers to focus on creating apps quickly without handling technical infrastructure. It is used for developing web and mobile applications.

Example: Google App Engine allows developers to build and deploy applications easily. Other examples include Microsoft Azure App Services and Heroku.

3. Software as a Service (SaaS):

Definition: SaaS is a cloud service that provides ready-to-use software applications over the internet. Users can access these applications by subscribing to them, without needing to install or maintain the software.

Use: It is used by individuals and businesses for tasks like email, document creation, and customer management. It saves time and effort because software updates and maintenance are done by the provider.

Example: Google Workspace (which includes Gmail, Google Docs, and Google Drive) is a popular SaaS service. Microsoft Office 365 and Salesforce are other examples.

Comparison of Cloud Services (IaaS, PaaS, SaaS):

IaaS (Infrastructure as a Service)	PaaS (Platform as a Service)	SaaS (Software as a Service)
Users control operating systems, apps, and storage.	Users control only the apps and data.	Users only use the software; no control over system or apps.
Provider manages hardware; users manage everything else.	Provider manages hardware and platform; users manage apps.	Provider manages everything including software and hardware.
Very flexible, good for IT experts who want to configure and manage systems their own way.	Good for developers to build and deploy apps easily.	Easy for users who want ready-to-use software.

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Pay only for the resources you use (servers, storage).	Pay for platform and tools to develop apps.	Pay subscription fees to use software online.
Amazon Web Services (AWS), Microsoft Azure	Google App Engine, Microsoft Azure App Services	Google Workspace (Gmail, Docs), Microsoft Office 365

Q.4. Describe "Cloud Deployment Models" with examples. / Define cloud deployment models and assess the differences among them. / What are the different Cloud Deployment Models? Explain each with examples and compare their key features.

Ans. Cloud deployment models describe how cloud services are made available to users. They define the ownership, accessibility, and management of cloud resources. There are four main types of cloud deployment models: **Public Cloud, Private Cloud, Hybrid Cloud, and Multi-Cloud.**

1. Public Cloud:

A public cloud is a cloud service that is available to the general public over the internet. It is owned and managed by a third-party cloud service provider. Resources are shared among multiple users or organizations.

- **Example:** Amazon Web Services (AWS), Microsoft Azure, and Google Cloud.
- **Use:** Ideal for small businesses and startups that want cost-effective services without maintaining physical hardware.

2. Private Cloud:

A private cloud is a type of cloud used only by one organization. It is not shared with anyone else. It gives more control, privacy, and security to the organization. The private cloud can be set up at the company's own location or managed by another trusted service provider.

- **Example:** A government agency or a bank using a private cloud to handle sensitive data securely.
- **Use:** Suitable for organizations that need strong data privacy and compliance, such as banks and hospitals.

3. Hybrid Cloud:

A hybrid cloud is a combination of both public and private clouds. It allows data and applications to be shared between them. Organizations can keep sensitive operations in the private cloud and use the public cloud for regular tasks.

- **Example:** A company runs customer data in a private cloud but uses a public cloud for general web services.
- **Use:** Best for businesses that need both flexibility and data security.

4. Multi-Cloud:

A multi-cloud model uses services from more than one public cloud provider. It helps avoid dependency on a single seller and increases availability.

- **Example:** A company using AWS for data storage and Microsoft Azure for software development tools.
- **Use:** Good for large organizations that want to improve performance and reduce risks by spreading their services.

Comparison of Cloud Deployment Models

Deployment Model	Cost	Security	Flexibility	Best Use Case
Public Cloud	Low cost as resources are shared among users.	Less secure due to shared environment.	Limited flexibility for customization.	Suitable for startups and small businesses with limited budgets.
Private Cloud	More expensive due to dedicated infrastructure.	Highly secure as it's used by only one organization.	Highly flexible and can be customized according to business needs.	Ideal for banks, hospitals, or government sectors with strict data requirements.

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Hybrid Cloud	Medium cost, based on the use of both public and private clouds.	Good security by keeping sensitive data in private cloud.	Very flexible, allows shifting workloads as needed.	Perfect for businesses needing both security and public cloud benefits.
Multi-Cloud	Cost varies depending on services used from multiple providers.	Secure if managed properly across platforms.	High flexibility, avoids vendor lock-in.	Useful for large enterprises focusing on performance, reliability, and risk-free deployment.

Each cloud deployment model has its own benefits and challenges. The choice depends on the organization's size, budget, and security needs. Understanding these models helps businesses choose the best cloud setup for their needs.

Q.5. Explain the key applications of cloud computing and discuss its major implications. How do businesses benefit from cloud computing, and what challenges do they face while using it?

Ans. Cloud computing means using the internet to store, manage, and process data on servers connected to the internet instead of using personal computers. It has become very important in the modern world. It is widely used in education, business, health, and many other fields.

Applications of Cloud Computing:

1. Data Storage:

- Cloud storage allows users to save data on remote internet servers instead of local computers.
 - This makes it easy to access the data anytime and from anywhere in the world.
 - It helps in sharing files quickly and safely with others.
 - Businesses also use cloud storage to keep backup copies of important data to protect against loss.
- Example:** Services like **Google Drive** and **Dropbox** offer cloud storage for both personal and business use.

2. Web Hosting and Content Delivery:

- Cloud computing provides powerful servers to host websites.
 - It ensures that websites run smoothly even when many users visit at the same time.
 - Content Delivery Networks (CDNs) store website content closer to users for faster access.
- Example:** Platforms like **Amazon Web Services (AWS)**, **Microsoft Azure**, and **Cloudflare** provide web hosting and content delivery solutions.

3. Machine Learning and Artificial Intelligence (AI):

- Cloud computing supports the development of AI and machine learning by providing powerful tools and resources.
 - It helps in training AI models using large amounts of data.
 - Developers and researchers can build smart applications without needing expensive computers.
 - Cloud AI improves services like speech recognition, face detection, and personalized recommendations.
 - It is used in industries like healthcare, marketing, and finance for better decision-making.
- Example:** Platforms like **Google Cloud AI** and **AWS SageMaker** allow users to create and run AI models easily.

Implications of Cloud Computing:

1. Data Security:

- Storing data on the cloud can be risky due to threats like hacking or data leaks.
 - Cloud companies use strong security tools like encryption and firewalls.
 - Users must also protect their data using strong passwords and two-step verification.
- Example:** In 2017, the **Equifax** company had a large data breach, showing that cloud data must be well-protected.

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2. Scalability and Resource Management:

- Cloud resources can increase or decrease based on the user's needs.
- This helps manage busy times by adding more resources and saves money during slow periods.
- Good monitoring is needed to avoid waste and high bills.

Example: Online stores add servers during sales like Eid and reduce them afterward.

3. Cost Considerations:

- Cloud services charge users based on how much they use.
- If services are not managed properly, costs can rise quickly.
- It is important to track usage and turn off services that are not needed.

Example: A small business had to pay extra because it forgot to stop unused cloud services.

4. Compliance and Regulatory Issues:

- Businesses must follow data privacy and security laws, which vary by country and industry.
- Cloud providers offer tools to help meet legal and regulatory requirements.

Example: Hospitals must follow health data rules like HIPAA when storing patient records on the cloud.

Benefits for Businesses:

- Cloud computing reduces the cost of buying and maintaining hardware.
- It allows businesses to grow easily by adding more resources when needed.
- Data and services are accessible from anywhere, helping teamwork and remote work.

Challenges for Businesses

- Protecting data on the cloud from cyber-attacks is difficult.
- Managing cloud usage and avoiding high costs requires planning.
- Following different laws and rules for data storage can be complicated.

Class Activity

Cloud-Based Services: List, Benefits, and Security Measures

1. Google Drive:

• Benefits:

- Lets me store documents, photos, and videos online.
- I can access my files from any device, anywhere.
- Easy to share files and work with classmates or colleagues on group projects.

• Security Measures:

- I use a strong password and enable two-factor authentication (2FA).
- I only share files with trusted people and set permissions (view or edit).
- Google encrypts files during upload and storage.

2. Gmail (Google Workspace):

• Benefits:

- Reliable email service with lots of storage.
- Helps organize emails with labels and filters.
- Integrates with Google Calendar and Drive for better productivity.

• Security Measures:

- Two-factor authentication is enabled.
- I regularly check for suspicious login activity.
- Google scans for spam and phishing emails.

3. Microsoft Office 365 (OneDrive, Outlook):

• Benefits:

- Access to Word, Excel, PowerPoint, and other tools online.
- OneDrive lets me save and share documents securely.
- Outlook helps manage emails and calendar events.

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- **Security Measures:**
 - Strong password and 2FA are used.
 - Files are encrypted and can be shared with specific people only.
 - Regular software updates to patch security issues.
- 4. **Dropbox:**
 - **Benefits:**
 - Simple way to store and share large files.
 - Syncs files automatically between devices.
 - Useful for group assignments and team projects.
 - **Security Measures:**
 - Uses password protection and offers 2FA.
 - I set sharing permissions and remove access when no longer needed.
 - Dropbox encrypts data in transit and at rest.
- 5. **Amazon Web Services (AWS):**
 - **Benefits:**
 - Used by my organization for hosting websites and storing big data.
 - Scalable resources-can add servers or storage as needed.
 - Reliable backup and disaster recovery options.
 - **Security Measures:**
 - Access is given only to authorized staff.
 - Data is encrypted, and regular security audits are done.
 - Uses firewalls, identity management, and monitoring tools.
- 6. **Zoom:**
 - **Benefits:**
 - Easy video meetings and online classes.
 - Screen sharing and recording features for collaboration.
 - **Security Measures:**
 - Meetings are password-protected.
 - Waiting rooms and host controls to allow only invited participants.
 - End-to-end encryption for meetings.

Summary Table:

Service	Benefits	Security Measures
Google Drive	Store/share files, access anywhere	Strong password, 2FA, file permissions
Gmail	Reliable email, organization tools	2FA, spam/phishing filters
Office 365	Online Office apps, file sharing	2FA, encryption, regular updates
Dropbox	Easy file storage/sharing	2FA, sharing controls, encryption
AWS	Website hosting, scalable storage	Access control, encryption, audits
Zoom	Video meetings/classes	Meeting passwords, waiting rooms, encryption

Q.6. Explain in your own words how blockchain works. Describe its key features, core principles, main components, and the role of peer-to-peer (P2P) networks, using simple examples.

Ans. Introduction to Blockchain Technology:

Blockchain is a modern and secure digital technology that allows people to share information or make transactions in a safe and transparent way. It works like a digital notebook (ledger) that is shared among all users in a group. Every person has the same copy of the notebook, and whenever someone writes or changes something, it is updated in all copies at once.

Example:

Imagine a group of friends keeping track of who owes money. Instead of using one notebook, all friends have the same copy. When one pays back, everyone's notebook is updated. This is how a blockchain network works.

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Main Features of Blockchain:

- **Transparency**
Everyone can see the same information in the notebook. It's difficult for anyone to cheat or hide anything.
- **Security (Cryptography)**
Once a transaction is written, it cannot be changed or removed. It is locked using mathematical codes.
- **Decentralization**
There is no single owner or controller. Every user has equal rights, and changes are only accepted if most users agree.

Core Principles of Blockchain:

The core principles of blockchain are the main rules and ideas that make this technology work in a secure, trustworthy, and efficient way. These principles are the foundation of how blockchain systems operate.

- **Decentralization**
Blockchain is not controlled by one person or authority. It is managed by many computers (nodes) that work together to check and add new information.
- **Immutability**
Once a block of transactions is added, it cannot be changed or deleted. This keeps the record permanent and trustworthy.
- **Consensus Mechanism**
All computers in the network must agree that a transaction is valid before it can be added. This avoids false or wrong data.

Key Components of Blockchain:

Blockchain is made up of several important components that work together to keep the system secure and running smoothly. These key components include nodes, ledgers, blocks, transactions, and protocols. Each component has a specific role in storing, verifying, and sharing information within the blockchain network.

- **Node**
A computer in the blockchain system. Each node keeps a full copy of the blockchain and helps verify transactions.
- **Ledger**
A shared digital notebook that records all the transactions.
- **Block**
A group of transactions bundled together. Each block contains:
 - A unique code (hash)
 - A link to the previous block (parent hash)
 - A list of transactions
- **Transaction**
A single record showing a transfer of information or digital assets from one person to another.
- **Blockchain Protocol**
A set of rules that controls how:
 - Transactions are checked
 - Blocks are added
 - Agreement (consensus) is reached

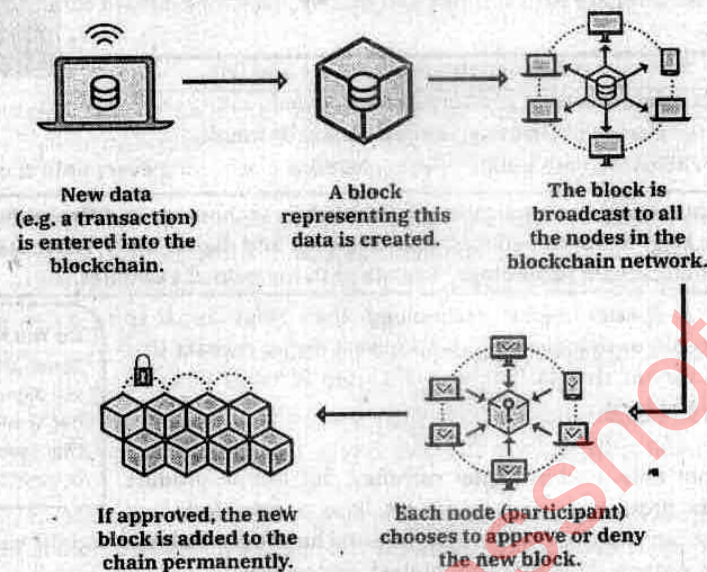
Peer-to-Peer (P2P) Network

- **Definition:**
A P2P network allows computers (nodes) to share information directly without a central server. Each node can both give and receive data.
- **Example:**
In a file-sharing system, users download files directly from each other. Similarly, blockchain users share and update data without needing a central authority.

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Blockchain is a secure, transparent, and fair system that does not rely on a single person or company. It is based on decentralization, strong security, and agreement by users. It uses important parts like nodes, blocks, and protocols, and works through a peer-to-peer system, making it reliable and efficient.

Blockchain Process



Q.7. Explain the role of blockchain technology in cryptocurrencies and smart contracts. Also describe other important uses of blockchain in various fields.

Ans. Blockchain technology is a modern digital system that records and secures information in a way that is transparent and cannot be changed. It is mainly known for supporting cryptocurrencies and smart contracts, but it also has many other useful applications.

Role of Blockchain in Cryptocurrencies:

- Blockchain is the main technology used in digital currencies like **Bitcoin** and **Ethereum**.
- It helps people **send and receive money** directly **without using banks**.
- All transactions are saved in a **safe and open record** called a **digital ledger**.
- It removes the need for **middlemen**, which makes transactions **faster and more transparent**.
- Blockchain ensures **security, trust, and accuracy** in financial transactions.

Role of Smart Contracts:

- **Smart contracts** are digital agreements that **work automatically** when certain conditions are met.
- These contracts are written in **computer code** and run on the **blockchain**.
- They remove the need for **lawyers or third parties**, which helps **save time and reduce errors**.
- But if the **code has a mistake**, it can create serious problems.
- Also, there must be **laws and courts** ready to solve problems if anything goes wrong.
- **Example:** A smart contract can **release payment** automatically when **goods are delivered**.

Use of Blockchain in Other Fields:

1. Supply Chain Management

- Blockchain helps in **tracking goods** from the **factory to the customer**.
- Every step of the product's journey is **recorded on the blockchain**.
- This makes the whole process **transparent and easy to check**.

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- It helps prevent **fraud**, confirms the **originality of products**, and reduces **mistakes**.
 - Companies can **know the exact location** of the product at any time.
2. **Healthcare**
- In healthcare, blockchain is used to **store medical records safely**.
 - Only **authorized people** like **doctors and nurses** can access these records.
 - It protects the **privacy of patients** and prevents **misuse of data**.
 - It helps hospitals **share data securely and quickly**, improving patient care.
3. **Voting Systems**
- Blockchain can make **voting systems more secure and fair**.
 - Each vote is **safely recorded** and **cannot be changed**.
 - It reduces the chance of **cheating, double voting, or fraud**.
 - This system helps increase **public trust in elections** by ensuring **every vote counts correctly**.

Q.8. Explain the applications and implications of blockchain technology in different fields. Include examples of product tracking, financial services, data security, and digital art. / What are the applications and implications of blockchain technology? Explain with the help of examples.

Ans. Blockchain is a **special digital technology** that helps to keep information **safe, clear, and unchangeable**. It works like a **digital register** that everyone can see but cannot change. Blockchain is used in many fields to improve **safety, speed, and trust**.

Importance:

Blockchain is not only used in **digital currency**, but also in **product tracking, banking, data protection, and digital art**. It is a **safe, fast, and transparent system** that can improve many areas of **life and business in Pakistan and the world**. As this technology grows, it will help make systems more **efficient, honest, and secure**.

Its main applications and implications are explained below:

1. **Tracking the Origin of Products:**

Blockchain provides a **transparent and secure way** to check where a product came from and how it reached the customer. Every **step in the supply chain** (**supplier, manufacturer, middleman, retailer, customer**) is recorded in a **digital ledger**. This record cannot be changed and helps to **stop fraud** and **prove the product is original**.

Example: The journey of a chocolate bar can be tracked from the **cocoa farmer** to the **final customer** using blockchain. Every person involved is recorded in the system.

2. **Blockchain in Financial Services:**

Banks and financial institutions use blockchain to make **money transactions faster, cheaper, and more secure**.

Example: When someone sends money to another country, it usually takes time and has extra charges. But with blockchain, the **transaction is quick and low-cost** because there is **no need for middlemen** like banks.

3. **Data Security in Blockchain:**

Blockchain keeps all **data safe** from being **changed or stolen**. This is possible with the help of **encryption, digital signatures, secure networks, and decentralization**. We can understand this with an example of sending a letter:

- **Encryption:** Like sealing a letter so only the receiver can open it, blockchain **encrypts the data** so only the **right person** can read it.
- **Digital Signature:** Like signing a letter with your name, blockchain uses a **digital signature** so the receiver knows it's from the right sender and hasn't been changed.
- **Blockchain Network:** Like using a trusted courier service, blockchain **tracks every step** and stops anyone from **changing the data**.
- **Decentralization:** Like sending the same letter to many trusted places, blockchain stores data in **many computers (called nodes)**, so the data stays **safe** even if one copy is lost or attacked.

Do You Know?

Some **artists** use blockchain to sell digital art. Each piece of art has a **unique digital signature** that proves **authenticity and originality**.

Do You Know?

Do you know? Big companies like Amazon and Microsoft use their powerful computers to help run blockchain networks.

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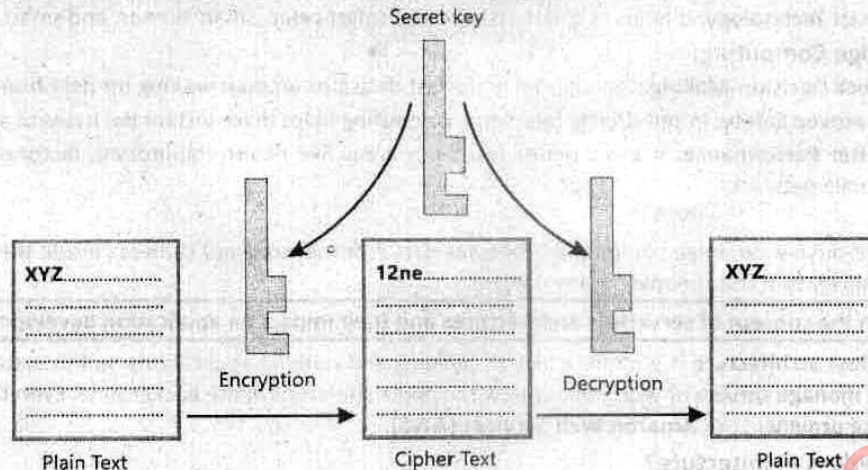


Figure: Cryptography keeps data secure in blockchain

Example: If you send important information to a friend, blockchain makes sure only your friend can open it, and everyone can see if someone tries to change it.

4. Use of Blockchain in Digital Art

Artists use blockchain to sell digital art safely. Each artwork has a unique digital signature, which proves it is the original. This helps the artist protect their work and stop others from copying it.

Class Activity

Secret Code Message

Step 1: Create a Secret Code

Let's use a simple code:

Replace each letter with the next letter in the alphabet.

(For example, A → B, B → C, C → D, ..., Z → A)

Step 2: Write Your Secret Message

Original Message:

MEET ME AFTER SCHOOL

Coded Message:

NFFU NF BGUFS TDPIPPM

Step 3: Send the Message

Share your coded message with your friend and ask them to decode it using your code.

Step 4: How to Decode

To decode, your friend should change each letter back to the previous letter in the alphabet.

Example for the Class

- **Your secret code:** NFFU NF BGUFS TDPIPPM
- **Decoded message:** MEET ME AFTER SCHOOL

Q9. Discuss the advancements and benefits of edge computing in modern technology.

Ans. Edge computing is a new and advanced form of cloud computing. In normal cloud computing, data is sent to remote data centers for processing. This takes more time. But in edge computing, data is processed near its source; for example, inside a machine or device. This saves time and gives faster results.

Advancements in Edge Computing:

1. **Faster Processing:** Now devices like cars, machines, and cameras can process data quickly without waiting.
2. **Less Delay (Low Latency):** Edge computing reduces the time it takes for data to travel. This is helpful for things that need fast responses.

Tidbits:

Edge computing is especially beneficial for applications requiring real-time processing and low latency, such as smart cities, healthcare monitoring, and industrial automation.

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3. **Smart Technology:** It helps in smart systems like smart cities, smart homes, and smart healthcare.

Benefits of Edge Computing:

1. **Quick Decision-Making:** Devices can make fast decisions without waiting for data from far places.
2. **Improved Safety:** In self-driving cars, edge computing helps make instant decisions to avoid accidents.
3. **Better Performance:** It gives better results in areas like health monitoring, factory machines, and mobile networks.

Example:

In a self-driving car, edge computing processes data from sensors and cameras inside the car. This helps the car react quickly to traffic, people, or any danger.

Q8. Explain the concept of serverless architectures and their impact on application development.

Ans. **Serverless architecture** is a modern way of building and running applications. In this system, developers do not need to **manage servers** or worry about how the application runs in the background. Everything is handled by **cloud service providers** like **Amazon Web Services (AWS)**.

What is Serverless Architecture?

Serverless architecture means developers can **create and launch applications** without setting up or looking after any servers. The **cloud provider** (like **AWS**) automatically takes care of **all the technical tasks**, such as **managing servers, scaling resources, and running the application**.

In this model:

- The developer **writes the code**.
- The cloud provider **runs the code**.
- Developers are **charged only for the actual time and resources** the application uses — not for full-time server space.

Importance:

- **Serverless architecture** is a **powerful new method** in **cloud computing**.
- It helps developers **create and launch apps easily, saves money, and removes the need to manage servers**.
- With services like **AWS Lambda**, **serverless** computing is **changing the future** of application development and making it more **efficient and flexible**.

Example:

A good example of **serverless computing** is **AWS Lambda**. With **AWS Lambda**, developers can upload their code, and it will run whenever needed — **without the need to manage any server**. This **saves time and cost**.

Impact on Application Development:

Serverless architecture has **made application development** faster and easier. Some key impacts are:

1. No Server Management:

Developers don't have to set up or manage **physical or virtual servers**. This makes the development process simple.

2. Scalability:

Applications **automatically grow (scale)** when there is more user demand. The **cloud provider** handles everything.

3. Cost-Effective:

Developers only **pay for what they use**. This is cheaper than keeping a server running all the time.

4. Focus on Code:

Developers can focus more on **writing better code** instead of spending time on **server issues or maintenance**.

5. Quick Deployment:

Applications can be **deployed (launched) quickly** because the cloud handles the heavy work.

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

Exercise

MULTIPLE CHOICE QUESTIONS

1. The main benefit of edge computing:
 - a) Lower cost
 - b) Reduced latency
 - c) Increased complexity
 - d) Enhanced security
2. A cloud deployment model with resources shared among multiple organizations with common concerns:
 - a) Public Cloud
 - b) Private Cloud
 - c) Community Cloud
 - d) Hybrid Cloud
3. The advantage of using a distributed ledger in blockchain technology:
 - a) Centralized control for quick decision-making
 - b) Easy alteration of transaction histories
 - c) Enhanced transparency and security through decentralized verification
 - d) Lower computational requirements
4. A cloud deployment model combining public and private cloud features:
 - a) Public Cloud
 - b) Hybrid Cloud
 - c) Community Cloud
 - d) Multi-Cloud
5. The purpose of a distributed ledger in blockchain:
 - a) Central authority management
 - b) Secure and transparent data sharing among multiple participants
 - c) Fewer participants required
 - d) Data visibility only to central authority
6. A cloud service offering a platform for developing, running, and managing applications without managing infrastructure:
 - a) Infrastructure as a Service (IaaS)
 - b) Platform as a Service (PaaS)
 - c) Software as a Service (SaaS)
 - d) Data as a Service (DaaS)
7. The service model enabling application deployment without server management:
 - a) Infrastructure as a Service (IaaS)
 - b) Platform as a Service (PaaS)
 - c) Software as a Service (SaaS)
 - d) Serverless Architecture
8. The feature introduced in Blockchain 2.0 beyond cryptocurrency:
 - a) Enhanced mining techniques
 - b) Decentralized applications and smart contracts
 - c) Better graphics
 - d) Faster internet speeds
9. The primary advantage of serverless architectures:
 - a) Cost savings
 - b) Constant server management
 - c) Increased hardware needs
 - d) Manual scaling

Correct Answers

Q. No	Correct Option
1.	b) Reduced latency
2.	c) Community Cloud - resources shared among multiple organizations
3.	c) Enhanced transparency and security through decentralized verification
4.	b) Hybrid Cloud - combining public and private cloud features
5.	b) Secure and transparent data sharing among multiple participants
6.	b) Platform as a Service (PaaS) - platform for developing applications
7.	d) Serverless Architecture - deployment without server management
8.	b) Decentralized applications and smart contracts
9.	a) Cost savings

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SHORT ANSWER QUESTIONS

Q.1. Analyze the role of Peer-to-Peer Networks in Blockchain. How do they function and why are they essential?

Ans. A Peer-to-Peer (P2P) Network is a system where all computers (called **nodes**) are connected directly without any central server. In **blockchain**, this network allows every node to **share data** and **verify transactions**.

Each node keeps a **copy of the blockchain**, so if one computer fails, the data is still safe on others. This makes the system **decentralized, secure**, and hard to hack.

P2P networks are essential in blockchain because they:

- Help in **sharing data equally** among all users.
- Make the system **transparent** and **trustworthy**.
- Allow transactions without needing a **central authority**.

So, P2P networks are the backbone of blockchain, keeping it strong and working smoothly.

Q.2. Describe the concept of immutability in blockchain. Why is it a critical feature?

Ans. In blockchain, **immutability** means that once information or a **transaction** is recorded, it **cannot be changed or deleted**. This is because each block is linked to the one before it, and changing any block would break the entire chain.

Immutability is a **critical feature** because it:

- Ensures **data security** and **accuracy**.
- Prevents **fraud** and **tampering** of records.
- Builds **trust** among users, as the information remains permanent.

This feature makes blockchain a **reliable technology** for things like banking, supply chains, and voting systems.

Q.3. What is edge computing and how does it benefit data processing?

Ans. **Edge computing** means processing data **close to where it is created**, like on a device or nearby computer, instead of sending it to faraway data centers.

It helps by:

1. **Reducing delay (latency)** – data is processed faster.
2. **Saving time** – useful for quick actions in real-time.
3. **Improving performance** – makes systems like **self-driving cars** and **smart cities** work better.

Q.4. Describe the concept of serverless architectures.

Ans. **Serverless architecture** is a way of building and running apps **without managing servers**. The **cloud company** (like AWS) handles everything needed to run the app.

Developers only need to **write the code**, and the cloud runs it **automatically**. They only **pay for the time** their code runs. This saves **time, effort, and money**.

Q.5. What advantages do serverless architectures offer to developers?

Ans. Serverless architectures give many benefits to developers:

1. **No server management** – Developers don't need to set up or manage servers.
2. **Saves time and effort** – They can focus only on writing code.
3. **Cost-effective** – They only **pay when the code runs**, which saves money.
4. **Automatic scaling** – The app adjusts automatically when more people use it.

Q.6. How does edge computing improve the efficiency of autonomous vehicles?

Ans. **Edge computing** helps autonomous vehicles by **processing data inside the vehicle** instead of sending it to faraway servers.

This gives three main benefits:

1. **Faster decision-making** – The car reacts quickly to road changes.
2. **Better safety** – It avoids accidents by giving quick responses.
3. **Less delay** – It saves time by not depending on internet speed.

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Q.7. Differentiate between Elasticity and On-Demand access in cloud computing.

Ans.

Elasticity	On-Demand Access
Elasticity means the cloud system can automatically increase or decrease resources (like storage or servers) as needed.	On-Demand Access means users can start or stop cloud services whenever they want.
It helps in handling more traffic during busy times and reducing usage when it is low.	It gives full control to the user to use services only when required.
Example: An online store adds more server power during a sale and reduces it after.	Example: A student turns on cloud storage to upload files and turns it off after use.

LONG QUESTIONS

Q.1. Define cloud deployment models and assess the differences among them.

Ans. See answer of chapter question # 4.

Q.2. Classify the various types of cloud services and compare them, highlighting key distinctions.

Ans. See answer of chapter question # 3

Q.3. Discuss the advancements and benefits of edge computing in modern technology.

Ans. See answer of chapter question # 9.

Q.4. Explain the concept of serverless architectures and their impact on application development.

Ans. See answer of chapter question # 8

Q.5. Describe "Cloud Deployment Models" with examples.

Ans. See answer of chapter question # 4.

EXTRA SLO BASED QUESTIONS

Q.1. What are emerging technologies? Give two examples.

Ans. Emerging technologies are new and advanced tools or systems that are still being developed or recently introduced. They have the potential to improve how we live, work, and interact with the world.

Examples:

- Artificial Intelligence (AI) – used in self-driving cars.
- Internet of Things (IoT) – used in smart home devices.

Q.2. What is Artificial Intelligence (AI)? Give one use and one example.

Ans. Artificial Intelligence (AI) is a technology where machines and software can think, learn, and act like humans.

Use: AI helps in speech recognition and making decisions.

Example: Virtual assistants like Siri and Google Assistant.

Q.3. Define Cloud Computing.

Ans. Cloud computing is a technology that allows users to access computing resources such as storage, servers, and applications through the internet. It saves cost and time because users pay only for what they use and don't need to manage physical hardware.

Q.4. What is Virtualization in cloud computing?

Ans. Virtualization is a process that allows one physical computer to work like many virtual computers. Each virtual machine can run its own software and operating system, helping in better use of hardware and reducing cost.

Q.5. Explain scalability and elasticity in cloud computing.

Ans. Scalability means increasing resources like storage or servers when needed without affecting the performance.

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Elasticity means automatically adjusting resources based on demand.

These help in running applications smoothly during busy times like sales events.

Q.6. What is on-demand access in cloud computing?

Ans. On-demand access means you can get and use computer services like storage or software whenever you need them, without delay.

Example: If a student needs more space to save a project, they can quickly add extra cloud storage and start using it right away.

Q.7. What are the types of cloud services? Name and define them briefly.

Ans. There are three main types of cloud services:

1. **IaaS (Infrastructure as a Service):** Provides basic resources like servers and storage.
2. **PaaS (Platform as a Service):** Offers tools to develop and manage applications.
3. **SaaS (Software as a Service):** Provides ready-to-use software over the internet.

Q.8. What is IaaS? Give one use and example

Ans. IaaS provides basic cloud services like virtual servers, storage, and networking.

Use: Useful for businesses needing flexible server space.

Example: Amazon Web Services (AWS).

Q.9. What is PaaS? Give one use and example.

Ans. PaaS is a cloud service that provides a platform for developers to build and deploy applications.

Use: Saves time by removing the need to manage hardware or system software.

Example: Google App Engine.

Q.10. What is SaaS? Give one use and example.

Ans. SaaS allows users to use software applications via the internet without installing them.

Use: Helpful for students or businesses to access tools online.

Example: Google Docs from Google Workspace.

Q.11. Define Public Cloud with example.

Ans. A public cloud is a cloud service shared by many organizations over the internet and managed by third-party providers.

Example: Amazon Web Services (AWS) used by many companies for data storage and servers.

Q.12. What is Private Cloud? Give one example.

Ans. A private cloud is used by only one organization. It provides better security and control.

Example: A bank may use a private cloud to protect customer data.

Q.13. What is a Hybrid Cloud? Give one example.

Ans. A hybrid cloud is a mix of public and private clouds. It allows data to move between them for better flexibility.

Example: A company may keep sensitive data in a private cloud and use a public cloud for regular tasks.

Q.14. What is Multi-Cloud? Why do companies use it?

Ans. Multi-cloud is the use of cloud services from more than one provider.

Use: It increases performance, reduces risk of failure, and avoids depending on one provider.

Q.15. Compare Public, Private, Hybrid, and Multi-Cloud models.

Ans.

Cloud Model	Used By	Key Features	Example
Public Cloud	Many users (shared)	Low cost, easy to use, less control	Amazon Web Services (AWS)
Private Cloud	One organization only	High security and control, more expensive	Bank using its own cloud
Hybrid Cloud	Mixed use (private + public)	Combines security with flexibility	Company storing sensitive data privately and other data publicly
Multi-Cloud	One user using many clouds	Increases reliability and avoids full dependence on one provider	Using both AWS and Google Cloud together

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Q.16. What is cloud computing?

Ans. Cloud computing is the use of the internet to store, manage, and process data instead of using a personal computer or local server. It allows users to access applications, files, and services from any device connected to the internet. Cloud computing is helpful for both individuals and businesses as it is flexible and cost-effective.

Q.17. What is cloud storage?

Ans. Cloud storage is a service that allows users to save their files and data on the internet instead of storing them on their own computers. This storage is managed by cloud service providers, and users can access their data anytime and from anywhere. It also helps in sharing and backing up important files easily.

Q.18. Name any two examples of cloud storage services.

Ans. Two commonly used cloud storage services are:

1. **Google Drive** – It allows users to store, edit, and share documents online.
2. **Dropbox** – It helps in saving and sharing files over the internet securely.

These services offer free and paid plans for personal and business use.

Q.19. What does web hosting mean in cloud computing?

Ans. Web hosting in cloud computing means using cloud servers to run and maintain websites. These servers store the website data and deliver it to users when they open the website. Cloud hosting helps websites load faster and stay available to users even if there is high traffic.

Q.20. Name any two platforms used for cloud-based web hosting.

Ans. Two major platforms for cloud-based web hosting are:

1. **Amazon Web Services (AWS)** – A widely used cloud platform for hosting websites and apps.
2. **Microsoft Azure** – Another popular service that provides tools for hosting and managing web applications.

Both offer fast and reliable services globally.

Q.21. What is machine learning in cloud computing?

Ans. Machine learning in cloud computing is the use of smart tools and powerful computing resources available on the internet to create programs that can learn from data and improve automatically. These programs can recognize images, understand speech, and make predictions.

Q.22. Write two examples of cloud-based AI platforms.

Ans. Two examples of cloud-based AI platforms are:

1. **Google Cloud AI** – Offers tools for building smart applications using machine learning.
2. **AWS SageMaker** – Helps developers train and use machine learning models easily in the cloud.

Q.23. What is data security in cloud computing?

Ans. Data security in cloud computing means protecting users' data stored online from threats like hacking, theft, or loss. It includes using strong passwords, encryption, and security software to make sure the data stays private and safe.

Q.24. What is scalability in cloud computing?

Ans. Scalability in cloud computing means the ability to increase or decrease computing resources (like storage or servers) as needed. **For example**, a business can use more resources during busy times and reduce them when not needed to save costs.

Q.25. What is meant by compliance in cloud computing?

Ans. Compliance in cloud computing means following the rules and laws related to data privacy and security. These rules can vary by country or industry. Cloud providers offer features to help users meet these legal requirements.

Q.26. Explain how cloud storage helps users and businesses.

Ans. Cloud storage helps users by allowing them to save their files online, so they can access them anytime and from any device. It makes file sharing easy with others.

For businesses, it provides a safe place to store backups and protects data from hardware failures. It also reduces the need for physical storage devices.

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Q.27. How does cloud computing support machine learning and AI?

Ans. Cloud computing gives access to powerful tools and large storage, which are needed to run machine learning and AI programs. It allows developers and researchers to build smart systems like voice assistants or image recognition apps without buying expensive equipment. Businesses use cloud AI to improve services and make better decisions.

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Q.28. Explain one benefit and one example of web hosting through cloud computing.

Ans. One major benefit of web hosting through cloud computing is speed and reliability. Websites can stay online even with many visitors.

Example: Amazon Web Services (AWS) helps companies host their websites efficiently, making them fast and always available for users.

Q.29. How does cloud computing help during busy times for online businesses?

Ans. Cloud adds more servers automatically during peak traffic.

Reduces resources when not needed to save money.

Example: Online shops increase resources during Eid or sales.

Q.30. What challenges do businesses face in cloud computing?

Ans.

- Keeping data safe from hackers or leaks.
- Managing usage to avoid high bills.
- Following different laws for data protection across countries.

Q.31. Explain the importance of cost management in cloud computing.

Ans. Cost management in cloud computing is important due to following reasons:

- Charges based on usage, so waste increases cost.
- Unused services must be turned off to save money.
- Regular monitoring helps control expenses.

Q.32. How can cloud users protect their data?

Ans.

- Use strong passwords and two-step verification.
- Encrypt sensitive files before saving to cloud.
- Choose trusted service providers and review settings often.

Q.33. Give one real-life example that shows the risks of weak data security in the cloud.

Ans.

- In 2017, Equifax lost private data of millions of users.
- The breach happened due to weak cloud security.
- This shows the need for strong protection of cloud data.

Q.34. Why is compliance important in cloud computing?

Ans.

- Businesses must follow laws to avoid legal issues.
- Different sectors have specific rules (e.g., hospitals follow HIPAA).
- Not following rules can lead to fines and loss of customer trust.

Q.35. List two benefits of cloud computing for businesses.

Ans.

- **Cost Saving:** No need for expensive physical equipment.
- **Easy Access:** Teams can access data anytime for better work.
- Helps in fast growth and better decision-making.

Q.36. Name two big companies that help run blockchain networks, and how do they support them?

Ans. Big companies like Amazon and Microsoft help run blockchain networks by using their powerful computers and cloud services. These computers provide the processing power and secure systems needed to manage and support blockchain operations around the world.

Q.37. What is Blockchain Technology?

Ans. Blockchain technology is a modern system used to store and share data in a safe and secure way. It works like a digital ledger or record book that is visible to everyone but cannot be changed. This makes it useful for keeping transparent and permanent records of any kind of digital transaction or information.

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

Q.38. Name two cryptocurrencies that are based on blockchain technology.

Ans. Two well-known cryptocurrencies that use blockchain technology are:

- **Bitcoin** – the first and most popular digital currency.
- **Ethereum** – a digital currency that also supports **smart contracts** and **decentralized apps**.
- Both ensure **secure, decentralized, and transparent** transactions using blockchain.

Q.39. What is a Smart Contract?

Ans. A **smart contract** is a type of **digital agreement** written in **computer code**. It works automatically when certain **conditions** are met. It runs on a **blockchain** and does not require **lawyers** or **middlemen**, which saves **time** and **money** and reduces the chance of **errors**.

Q.40. What is Decentralization in blockchain?

Ans. **Decentralization** means the data is stored on **many computers** (called **nodes**) instead of one central system. This makes blockchain **more secure**, as no single computer controls the whole network. If one part fails, the rest continue working, protecting the data from loss or attack.

Q.41. How does blockchain ensure data security?

Ans. Blockchain uses **encryption** to protect data and **digital signatures** to confirm its source. Each transaction is stored in a **block** and connected to other blocks, making changes easily noticeable. Also, **decentralization** keeps copies of data on many computers, keeping it safe even if one system fails.

Q.42. How is blockchain helpful in supply chain management?

Ans. Blockchain is useful in **supply chain management** because it keeps a record of every step of a product's journey — from **supplier** to **customer**. It helps check the **authenticity** of the product, prevents **fraud**, and reduces **errors**. The entire process becomes **transparent** and **traceable**.

Q.43. Explain the role of smart contracts in the business world.

Ans. **Smart contracts** help businesses by doing tasks **automatically** when set conditions are met. They remove the need for **middlemen** like lawyers and banks. For example, when goods are delivered, the payment can be released automatically. This saves **time**, reduces **mistakes**, and makes work **faster and cheaper**.

Q.44. How can blockchain be used in voting systems?

Ans. Blockchain can make **voting systems** more **secure** and **transparent**. Each vote is recorded in a way that cannot be changed. This ensures that **every vote** is counted correctly and reduces the chances of **cheating** or **election fraud**, increasing public trust in the voting process.

Q.45. Describe how encryption and digital signatures help in blockchain security.

Ans. In blockchain, **encryption** turns the data into a special code so only the right person can read it. **Digital signatures** confirm that the data is real and not changed. Together, they protect the system from **hackers**, **unauthorized access**, and **data loss**, keeping it **safe and trustworthy**.

Q.46. What role do companies like Amazon and Microsoft play in blockchain networks?

Ans. Companies like **Amazon** and **Microsoft** support blockchain by providing **cloud computing services** and **powerful computers**. These services help store blockchain data, run smart contracts, and keep the system **efficient, fast, and secure** for users all over the world.

Q.47. What is edge computing and how does it improve cloud computing?

Ans. **Edge computing** processes data near the **source**, such as a device or machine, instead of sending it to distant **data centers**. This reduces **delay (latency)** and allows **faster decision-making**. It improves **cloud computing** by making applications more **efficient** and suitable for **real-time tasks** like **autonomous vehicles** and **smart cities**.

Q.48. Give an example of edge computing and explain its benefit.

Ans. An example of **edge computing** is in **autonomous vehicles**. **Sensors** and **cameras** in the vehicle process data **locally**, by enabling **quick responses** to road changes. This improves **safety** because decisions happen instantly without waiting for data to travel to a **central server**.

Q.49. What are the benefits of edge computing in modern technology?

Ans. **Edge computing** offers **faster data processing** and **lower latency(delay)**, which is important for **real-time applications**. It improves **safety, efficiency, and performance** in fields like **healthcare monitoring**, **industrial automation**, and **smart cities** by allowing quick decisions near the **data source**.

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

Q.50. Define serverless architecture.

Ans. Serverless architecture is a cloud computing model where developers build and deploy applications without managing servers. The cloud provider automatically allocates resources as needed, and developers pay only for the computing time their code uses.

Q.51. Explain how AWS Lambda works as an example of serverless computing.

Ans. AWS Lambda lets developers run their code without setting up or managing servers. It automatically runs the code when triggered and scales resources based on demand. This allows developers to focus on coding rather than infrastructure management.

Q.52. Mention two main impacts of serverless architecture on application development.

Ans. Two main impacts of serverless architecture on application development are:

1. Developers do not need to worry about managing or maintaining servers, which makes their work easier.
2. The application can automatically grow or shrink depending on how many users are using it, without developers needing to do anything.

Q.53. Why is serverless computing cost-effective?

Ans. Serverless computing is cost-effective because developers only pay when their code is working. They don't have to pay for a server all the time. This saves money because there is no extra cost when the app is not being used.

Important MCQs

Emerging Technologies

1. Which of the following is an example of an emerging technology?

- A) Landline telephone
- B) Artificial Intelligence (AI)
- C) Typewriter
- D) Steam engine

2. Which technology adds digital elements to the real world using smartphones?

- A) Virtual Reality (VR)
- B) Augmented Reality (AR)
- C) Blockchain
- D) Quantum Computing

3. Which technology uses qubits for faster problem-solving?

- A) Quantum Computing
- B) Blockchain
- C) SaaS
- D) VR

4. Biotechnology uses living organisms to:

- A) Create new products or solve problems
- B) Build computers
- C) Make video games
- D) Design websites

Cloud Computing

5. Cloud computing allows users to:

- A) Store data only on their own computer
- B) Store and access data over the internet

C) Only play online games

D) Use only one application at a time

6. What is virtualization in cloud computing?

- A) Making physical copies of computers
- B) Allowing one physical machine to run multiple virtual machines
- C) Encrypting data
- D) Increasing internet speed

7. Scalability in cloud computing means:

- A) Always using the same resources
- B) Ability to increase or decrease resources as needed
- C) Encrypting data
- D) Using only one server

8. Which is NOT a cloud computing service?

- A) Google Drive
- B) Dropbox
- C) Microsoft Paint
- D) Amazon Web Services (AWS)

9. Which of the following is a type of cloud service?

- A) IaaS
- B) PaaS
- C) SaaS
- D) All of the above

10. Which is an example of Infrastructure as a Service (IaaS)?

- A) Gmail
- B) Google App Engine
- C) Amazon Web Services (AWS)
- D) Salesforce

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

11. Software as a Service (SaaS) allows users to:

- A) Build their own servers
- B) Use software over the internet
- C) Manage physical hardware
- D) Buy new computers

12. A public cloud is:

- A) Used by only one organization
- B) Shared by many organizations and managed by a third party
- C) Always offline
- D) Only for government use

13. A hybrid cloud:

- A) Combines public and private clouds
- B) Is only for banks
- C) Is not secure
- D) Is only for schools

14. The main benefit of cloud storage is:

- A) Data can only be accessed from one computer
- B) Data is accessible from anywhere with internet
- C) Data is never backed up
- D) Data is always public

15. Which is an example of a cloud storage service?

- A) Dropbox
- B) Notepad
- C) Calculator
- D) Paint

16. Which of the following is a security measure in cloud computing?

- A) Weak passwords
- B) Encryption
- C) Ignoring updates
- D) Sharing passwords

17. Which cloud deployment model is most cost-effective but less secure?

- A) Public cloud
- B) Private cloud
- C) Hybrid cloud
- D) Multi-cloud

18. Which cloud deployment model offers the most flexibility?

- A) Hybrid cloud
- B) Public cloud
- C) Private cloud
- D) None of the above

19. Which of the following is an implication of cloud computing?

- A) Data security concerns
- B) No need for internet
- C) Only works on weekends
- D) No cost management

20. Which is a common application of cloud computing in business?

- A) Data storage and backup
- B) Making phone calls
- C) Drawing pictures
- D) Sending letters

Blockchain Technology

21. Which technology is the foundation of cryptocurrencies like Bitcoin?

- A) Cloud Computing
- B) Blockchain
- C) 5G
- D) IoT

22. Which is a key principle of blockchain?

- A) Centralization
- B) Immutability
- C) Slow processing
- D) Single point of failure

23. A block in blockchain is:

- A) A group of transactions
- B) A single computer
- C) A type of contract
- D) An email

24. Consensus mechanisms in blockchain are used to:

- A) Agree on the validity of transactions
- B) Send emails
- C) Increase internet speed
- D) Print documents

25. A smart contract is:

- A) An automated agreement written in code
- B) A paper contract
- C) A cloud service
- D) A type of software update

26. Blockchain is often described as:

- A) A digital notebook everyone can see but no one can change
- B) A private diary
- C) A video game
- D) A calculator

27. Cryptocurrencies are:

- A) Digital currencies using blockchain
- B) Paper money
- C) Coins in a piggy bank
- D) Credit cards

28. Which is a benefit of using blockchain in voting systems?

- A) Secure and transparent voting
- B) More paperwork
- C) Slower counting
- D) Less security

29. Which of the following is a component of blockchain?

- A) Node
- B) Ledger
- C) Block
- D) All of the above

30. How does blockchain help in financial services?

- A) Makes transactions faster and safer
- B) Slows down payments
- C) Increases paperwork
- D) Removes all security

COMPUTER SCIENCE NOTES FOR CLASS – 11 (FOR PUNJAB)

Edge and Serverless Computing

31. Which technology processes data closer to where it is created?

- A) Edge Computing B) Cloud Storage
C) Blockchain D) SaaS

32. The main benefit of edge computing:

- A) Lower cost
B) Reduced latency
C) Increased complexity
D) Enhanced security

33. Serverless architecture allows developers to:

- A) Build apps without managing servers
B) Always manage servers
C) Only use one programming language
D) Print documents

34. Which is an example of a serverless computing service?

- A) AWS Lambda B) Notepad
C) Paint D) Dropbox

ANSWER KEY

1.	B	2.	B	3.	A	4.	A	5.	B	6.	B	7.	B	8.	C	9.	D	10.	C
11.	B	12.	B	13.	A	14.	B	15.	A	16.	B	17.	A	18.	A	19.	A	20.	A
21.	B	22.	B	23.	A	24.	A	25.	A	26.	A	27.	A	28.	A	29.	D	30.	A
31.	A	32.	B	33.	A	34.	A												

