📝 Short Answers for Assignment-2 Questions

Here are short answers summarizing the concepts for the questions in the provided assignment:

- **1. Discuss crawling, indexing, and ranking in context to search engines.**
  - **Crawling:** The process where search engine bots (spiders) discover and scan web pages by following links.
  - **Indexing:** The process of storing and organizing the content of the discovered web pages in a massive database (the search index).
  - **Ranking:** The process of ordering the indexed pages in the search results based on relevance and quality in response to a user's query.
- **2. Name the two type of records that are present in the block chain database.**
  - The two main types of records are **transaction records** (data/value transfer) and **block records** (containing multiple transactions and a hash linking to the previous block).
- **3. Define big data analytics.**
  - Big data analytics is the process of examining large and varied datasets (Big Data) to uncover hidden patterns, unknown correlations, market trends, customer preferences, and other useful business information.
- **4. Compare quantum computing with classing computing.**
  - **Classical Computing** uses **bits** (0 or 1) to store information.
  - **Quantum Computing** uses **qubits**, which can represent 0, 1, or both simultaneously (superposition) and leverage entanglement to perform complex calculations much faster for specific problems.
- **5. Summarize the applications of Industrial Internet of Things (IIoT).**
  - Applications include **predictive maintenance** (monitoring equipment to anticipate failures), **asset tracking and management**, **optimizing supply chains**, **improving operational efficiency** through real-time data, and **remote monitoring** of industrial processes.
- **6. Explain the architecture of Amazon Web Services (AWS).**
  - AWS architecture is built around **Regions** (geographical areas), which contain multiple isolated **Availability Zones (AZs)**. Key services include compute (EC2), storage (S3), databases (RDS), and networking, all accessed over the internet.
- **7. What are the elements of Internet architecture?**
  - Key elements include **packet switching** (breaking data into small packets), **TCP/IP protocol suite** (defining how data is transmitted), **routers and gateways** (directing traffic), and **client-server models** (how applications communicate).

- **8. On what basis can a city be called a smart city? Illustrate the role of technology for making a city to be a smart city.**
  - A city is "smart" based on how it uses **Information and Communication Technologies (ICT)** to enhance performance, citizen well-being, and resource usage.
  - **Technology's role** involves deploying **IoT sensors** for data collection (traffic, air quality), **data analytics** for informed decision-making, and **smart grids** for energy efficiency.
- **9. Demonstrate the difference between SaaS, PaaS and IaaS related to cloud computing.**
  - **SaaS (Software as a Service):** Provides the entire application, managed by the provider (e.g., Gmail, Office 365).
  - **PaaS (Platform as a Service):** Provides a development and deployment environment, managed by the provider (e.g., AWS Elastic Beanstalk, Google App Engine).
  - **IaaS (Infrastructure as a Service):** Provides basic computing resources like virtual machines, storage, and networks (e.g., AWS EC2, Microsoft Azure VMs).
- **10. What is block chain? How is the block chain created? Explain the use of the Genesis block.**
  - **Blockchain:** A decentralized, distributed, and immutable ledger that records transactions across many computers.
  - **Creation:** It is created by linking new **blocks** (containing verified transactions) to the preceding block using cryptographic hashing.
  - **Genesis Block:** The very first block in a blockchain, which is hard-coded and serves as the foundation and root of the entire chain.
- **11. Explain the architecture of brain computer interface. Give its applications.**
  - **Architecture:** Typically involves **signal acquisition** (e.g., EEG, ECoG, fMRI), **signal processing** (filtering, feature extraction), **translation algorithms** (converting signals into commands), and **output devices** (controlling a prosthetic or computer).
  - **Applications:** Restoring sensory and motor functions (e.g., controlling robotic arms, communication for paralyzed patients), and neural rehabilitation.
- **12. Explain the terms recycling and reusing in context to green computing?**
  - **Recycling:** Processing used or discarded computing equipment (like computers, monitors, batteries) into new products to reduce e-waste and conserve resources.
  - **Reusing:** Extending the life of computer equipment by donating, selling, or repurposing components or entire systems instead of disposal.
- **13. Write a short note on the concept of Internet of things.**

- ○ The IoT is a network of **physical objects** (things) embedded with **sensors, software, and other technologies** for the purpose of connecting and exchanging data with other devices and systems over the internet.
- **14. Explain the function of web browser in short.**
  - ○ The function of a web browser is to **retrieve, present, and navigate** information resources on the World Wide Web (WWW). It interprets HTML, CSS, and JavaScript to display a web page.
- **15. Briefly explain any two application areas of block chain.**
  - ○ **Cryptocurrency:** Enabling secure, decentralized digital currency transactions (e.g., Bitcoin).
  - ○ **Supply Chain Management:** Providing an immutable record of a product's journey from origin to consumer for transparency and tracking.
  - ○ *(Other common applications: Voting, Healthcare records, Digital Identity)*
- **16. Differentiate between public and private cloud.**
  - ○ **Public Cloud:** Services offered over the public internet and owned/operated by a third-party provider, available to anyone (e.g., AWS, Azure).
  - ○ **Private Cloud:** Cloud infrastructure operated solely for a single organization, which can be managed by the organization or a third party, and may be located on-site.
- **17. Define the term green computing. Describe basic services of Internet.**
  - ○ **Green Computing:** The environmentally responsible use of computers and computing resources, aiming to minimize the environmental impact of computing.
  - ○ **Basic Services:** Include the **World Wide Web (WWW)** (accessing web pages), **Email** (electronic mail communication), **FTP (File Transfer Protocol)** (transferring files), and **Telnet** (remote computer access).
- **18. Discuss and compare concepts of augmented reality and virtual reality.**
  - ○ **Augmented Reality (AR):** Overlays computer-generated images or data onto the **real world** view, enhancing it (e.g., Pokémon GO, navigation overlays).
  - ○ **Virtual Reality (VR):** Creates a fully immersive, computer-generated **virtual environment** that replaces the user's real-world view (e.g., VR gaming, training simulations).
- **19. Explain historical development of Internet.**
  - ○ The Internet began as **ARPANET** in the late 1960s (a project funded by the US Department of Defense). It evolved through the development of the **TCP/IP protocols** and subsequent connections between university

and research networks, finally becoming commercialized and globalized with the introduction of the **World Wide Web** in the 1990s.

- **20. Describe various components of a grid with diagram.**
  - A computational **Grid** consists of interconnected, distributed resources. Components typically include **Grid Users/Clients**, **Resource Providers** (offering computation, storage, or data), and **Grid Middleware** (software that manages and coordinates resource sharing and communication).
- **21. Explain email with example. What do you mean by FTP?**
  - **Email (Electronic Mail):** A method of exchanging digital messages from an author to one or more recipients (e.g., sending a message from `user@example.com` to `friend@server.org`).
  - **FTP (File Transfer Protocol):** A standard network protocol used to transfer computer files between a client and server on a computer network.
- **22. Describe IBM services. Explain Emerging technology.**
  - **IBM Services:** IBM offers a wide range of services including **cloud computing**, **AI/Cognitive computing** (e.g., IBM Watson), **consulting services** for digital transformation, and **IT infrastructure management**.
  - **Emerging Technology:** A new technology that is currently developing or is expected to be available within the next five to ten years, and which will significantly alter the business or social environment (e.g., Quantum Computing, advanced AI).
- **23. Explain any three web browsers with its features.**
  - **Google Chrome:** Fast, synchronized across devices, extensive extension library.
  - **Mozilla Firefox:** Open-source, strong privacy features, robust developer tools.
  - **Microsoft Edge:** Built on Chromium, integrates well with Windows 10/11, has a "Collections" feature.
- **24. Describe Crypto currencies with application.**
  - **Cryptocurrency:** A digital or virtual currency secured by cryptography, making it nearly impossible to counterfeit or double-spend. They are typically decentralized and based on blockchain technology.
  - **Application:** Primary application is as a **medium of exchange** for purchases and transfers without traditional intermediaries (banks).
- **25. Differentiate between Green computing Vs Grid computing.**
  - **Green Computing:** Focuses on minimizing the **environmental impact** of computing, often by reducing power consumption and e-waste.
  - **Grid Computing:** Focuses on providing **massive computational power** by harnessing and coordinating distributed, heterogeneous resources to solve large-scale problems.

- **26. Explain sensors with its types in detail.**
  - **Sensor:** A device that detects and responds to some type of input from the physical environment (e.g., heat, light, motion) and converts it into an electrical signal.
  - **Types (Examples): Temperature sensors** (thermistors, thermocouples), **Proximity sensors** (detects object presence without physical contact), **Light sensors** (photodiodes), and **Motion sensors** (accelerometers, gyroscopes).
- **27. How IOT is different from Industrial IOT.**
  - **IoT (Internet of Things):** Focuses on connecting consumer and lifestyle devices (smart home, wearables).
  - **IIoT (Industrial Internet of Things):** Focuses on connecting devices, machines, and sensors within industrial sectors (manufacturing, energy, logistics), prioritizing **reliability, precision, and security** for critical operations.
- **28. Describe cloud computing and their benefits.**
  - **Cloud Computing:** The delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.
  - **Benefits: Cost savings** (pay-as-you-go), **scalability** (easy resource adjustment), **high availability**, and **disaster recovery**.
- **29. What do you mean by WWW and Telnet?**
  - **WWW (World Wide Web):** An information system on the Internet that allows documents and other web resources to be accessed via hyperlinks, using web browsers.
  - **Telnet:** An application protocol used to provide a **command-line interface** for remote login and communication with a remote computer over a network.
- **30. Differentiate between search engines and web browsers.**
  - **Web Browser:** A software application used to access and display content on the World Wide Web (e.g., Chrome, Firefox).
  - **Search Engine:** A program that searches for and identifies items in a database that correspond to keywords or characters specified by the user, providing a ranked list of results (e.g., Google, Bing).