Answer Key: jsb

Section 1 (5 marks per question)

Q1. Explain the role of Cloud computing in IoT

Keywords:

Cloud infrastructure, data analytics

Main Points:

• Complements IoT devices with computational capabilities
• Supports device virtualization, availability, and data storage

Detailed Explanation:

Cloud computing provides the necessary resources and services to support the limited capabilities of IoT devices.

Examples:

• Data processing and storage
• Device management

Q2. Discuss the challenges faced in IoT programming

Keywords:

Heterogeneity, Data volume, Latency

Main Points:

• Heterogeneity of data and devices
• Large volume and varying forms of data
• Latency-sensitive applications

Detailed Explanation:

IoT applications encounter challenges due to the diverse nature of devices and data, as well as the need for real-time processing.

Examples:

• Different hardware and communication protocols
• Handling streaming data from sensors

Q3. How do programming frameworks address the challenges in IoT?

Keywords:

Abstraction, Interoperability

Main Points:

• Abstraction and simplification of complex tasks
• Provision of standard interfaces and protocols
• Support for scalability and interoperability

Detailed Explanation:

Programming frameworks provide tools and libraries that simplify the development of IoT applications by addressing common challenges.

Examples:

• Device management libraries
• Data analytics platforms

Q4. Explain the significance of language runtime in IoT applications

Keywords:

Language runtime, Footprint, Cost

Main Points:

• Impacts the footprint and cost of the application
• C is preferred for embedded applications due to its performance
• Choice of communication protocols affects application cost

Detailed Explanation:

The choice of programming language and its runtime environment has a direct impact on the resource utilization and cost of IoT applications.

Examples:

• Small footprint languages like C save memory
• Communication protocols like CoAP reduce overhead

Q5. Describe the scope of Cloud computing in IoT

Keywords:

Cloud scope, IoT platforms

Main Points:

• Extended reach of Cloud computing into the real world
• New platforms and services for IoT
• Massive storage and computing capabilities

Detailed Explanation:

Cloud computing plays a pivotal role in enabling the growth and adoption of IoT by providing the necessary infrastructure and services.

Examples:

• SaaS for sensor data collection
• SAaaS for remote control

Q6. Discuss the challenges in managing IoT data

Keywords:

Data management, Heterogeneity, Security

Main Points:

• Heterogeneity of data formats
• Large volume and velocity of data
• Security and privacy concerns

Detailed Explanation:

The vast and diverse nature of IoT data brings forth challenges in storage, processing, and securing the information.

Examples:

• Data from sensors, actuators, and other devices
• Privacy risks associated with personal data

Q7. Explain the need for edge processing in IoT

Keywords:

Edge processing, Real-time, Latency

Main Points:

• Reduces latency for real-time applications
• Improves responsiveness and efficiency
• Handles data pre-processing and filtering

Detailed Explanation:

Edge processing is crucial for IoT applications that require low latency and quick response times.

Examples:

• Traffic management systems
• Industrial automation

Q8. Describe the importance of sustainability in IoT applications

Keywords:

Sustainability, Energy efficiency, Lifespan

Main Points:

• Energy efficiency and low power consumption
• Optimizing the use of resources
• Extending the lifespan of devices

Detailed Explanation:

Sustainability considerations are paramount in IoT applications to ensure long-term operation and minimize environmental impact.

Examples:

• Use of low-power devices
• Energy-saving algorithms

Q9. Discuss the role of communication protocols in IoT

Keywords:

Communication protocols, Reliability, Interoperability

Main Points:

• Efficient data transmission
• Reliability and security
• Support for diverse devices and networks

Detailed Explanation:

Communication protocols are essential for IoT to enable communication between devices, gateways, and cloud platforms.

Examples:

• MQTT for low-bandwidth devices
• CoAP for constrained networks

Q10. Explain the concept of programmability in IoT

Keywords:

Programmability, Customization, Integration

Main Points:

• Ability to configure and customize IoT devices and applications
• Enables remote management and updates
• Simplifies integration with other systems

Detailed Explanation:

Programmability is crucial in IoT to unlock the full potential of connected devices and to adapt to changing requirements.

Examples:

• Firmware updates over-the-air
• Custom scripts for data analysis