| Reg. No. | | | | | | | | | | | | | | | |
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| Question Paper Code | 13274 |
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**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024**

Fifth Semester

**Artificial Intelligence and Data Science**

**20AIPC504 - IOT AND SENSORS TECHNOLOGIES**

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

| | | *Marks* | *K – Level* | *CO* |
|---|---|---|---|---|
| 1. | What is the primary goal of IoT?<br>(a) To create virtual machines in the cloud<br>(b) To interconnect everyday objects for data exchange and automation<br>(c) To improve entertainment and media platforms<br>(d) To enhance personal computing performance | *1* | *K1* | *CO1* |
| 2. | Which of the following relates to the logical design of IoT?<br>(a) Device power sources (b) Data flow and communication protocols<br>(c) Sensor material design (d) Device casings | *1* | *K2* | *CO1* |
| 3. | Which sector has seen significant IoT adoption?<br>(a) Health Care (b) Aviation (c) Publishing (d) Agriculture | *1* | *K1* | *CO1* |
| 4. | In the functional view of IoT architecture, which layer is primarily responsible for processing data and managing applications?<br>(a) Perception Layer (b) Application Layer (c) Middleware Layer (d)Transport Layer | *1* | *K2* | *CO2* |
| 5. | How does the IETF model enhance IoT device connectivity in low-power environments?<br>(a) By improving processing power<br>(b) By using lightweight protocols like CoAP and 6LoWPAN to reduce power consumption<br>(c) By increasing the memory capacity of the devices<br>(d) By reducing the number of devices connected to the network | *1* | *K2* | *CO2* |
| 6. | How can an SOA-based architecture be applied to improve the flexibility of an IoT system?<br>(a) By allowing the addition or removal of services without disrupting the entire system<br>(b) By centralizing all control and data storage<br>(c) By reducing the number of deployed sensors<br>(d) By limiting the system's scalability | *1* | *K2* | *CO2* |
| 7. | Which IoT protocol follows a client-server architecture and is widely used for transmitting web data?<br>(a) MQTT (b) HTTP (c) CoAP (d) SCADA | *1* | *K2* | *CO3* |
| 8. | A smart agriculture system uses IEEE 802.15.4 for sensor communication. How would you evaluate the protocol's suitability in terms of range, power consumption, and data rates?<br>(a) It offers high data rates and short range, suitable for high-power devices<br>(b) It provides low data rates and power-efficient communication for long-range applications<br>(c) It is designed for real-time communication with high power consumption<br>(d) It supports multiple high-bandwidth devices in a single network | *1* | *K2* | *CO3* |

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| 9. | In an IoT network with low-power devices, which protocol is used to efficiently transmit IPv6 packets over wireless networks?<br>(a) TCP (b) 6LoWPAN (c) XMPP (d) SCADA | *1* | *K2* | *CO3* |
| 10. | When interfacing sensors with Raspberry Pi using I2C, which of the following is a correct application of the protocol?<br>(a) Using two wires for data and clock communication with multiple devices<br>(b) Using four wires for dedicated device communication<br>(c) Sending data in parallel to multiple devices simultaneously<br>(d) Communicating directly over GPIO pins without a clock signal | *1* | *K2* | *CO4* |
| 11. | While writing a Python program on Raspberry Pi to read input from a GPIO pin, what command would you use to configure the pin as an input pin?<br>(a) GPIO.setup(pin_number, GPIO.OUT) (b) GPIO.setup(pin_number, GPIO.IN)<br>(c) GPIO.output(pin_number, GPIO.IN) (d) GPIO.read(pin_number, GPIO.IN) | *1* | *K2* | *CO4* |
| 12. | In Python programming on a Raspberry Pi, which library is commonly used to interface external gadgets and control GPIO pins?<br>(a) gpiozero (b) pandas (c) matplotlib (d) scikit-learn | *1* | *K2* | *CO4* |
| 13. | Which sensor would be most suitable for monitoring soil moisture levels in agriculture?<br>(a) DHT11 (b) Voltage sensor (c) Ultrasonic distance sensor (d) Level sensor | | *K2* | *CO5* |
| 14. | Which of the following statements best describes the function of an actuator in an IoT system?<br>(a) It collects data from the environment.<br>(b) It converts physical phenomena into electrical signals.<br>(c) It performs actions based on control signals.<br>(d) It processes and analyzes data. | *1* | *K2* | *CO5* |
| 15. | Which programming language is commonly used to program Arduino boards?<br>(a) Python (b) C/C++ (c) Java (d) Ruby | *1* | *K2* | *CO5* |
| 16. | Evaluate the role of wireless Bluetooth sensors in a smart home environment. Discuss potential advantages and limitations.<br>(a) Bluetooth sensors have unlimited range but require constant power supply.<br>(b)Bluetooth sensors provide convenient short-range communication, reducing wiring complexity, but may face connectivity issues with distance.<br>(c) Bluetooth sensors are only useful for detecting motion.<br>(d) Bluetooth sensors do not require a microcontroller. | *1* | *K2* | *CO5* |
| 17. | What is the primary benefit of implementing smart home technology?<br>(a) Increased manual controls for appliances<br>(b) Enhanced energy efficiency through automation<br>(c) Higher initial costs without long-term savings<br>(d) Reduced internet connectivity requirements | *1* | *K2* | *CO6* |
| 18. | How can IoT sensors improve agricultural productivity?<br>(a) By increasing labor costs<br>(b) By monitoring crop conditions and automating irrigation<br>(c) By replacing all manual farming practices<br>(d) By reducing the need for data analysis | *1* | *K2* | *CO6* |
| 19. | In traffic monitoring systems, what is the primary benefit of using video analytics?<br>(a) Increased vehicle congestion<br>(b) Manual data collection<br>(c) Real-time traffic flow analysis and congestion detection<br>(d) Limited data processing capabilities | *1* | *K2* | *CO6* |
| 20. | For a weather monitoring system, which data parameter is crucial for predicting rainfall?<br>(a) Soil Ph (b) Humidity (c) Wind speed (d) Air pressure | *1* | *K2* | *CO6* |

## PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

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| 21. | What are the functions of sensors in an IoT system? | *2* | *K2* | *CO1* |
| 22. | Differentiate between ZigBee and Wi-Fi in IoT communication. | *2* | *K2* | *CO1* |
| 23. | Discuss the information view of IoT architecture. | *2* | *K2* | *CO2* |
| 24. | How can the OGC architecture be applied to improve location-based services in a smart city IoT system? | *2* | *K3* | *CO2* |
| 25. | Define 6LoWPAN and list its use in IoT networks. | *2* | *K2* | *CO3* |
| 26. | Mention the various frame types supported in the IEEE 802.15.4 standard. | *2* | *K2* | *CO3* |
| 27. | Differentiate between the SPI and I2C communication protocols used for interfacing devices with Raspberry Pi. | *2* | *K2* | *CO4* |
| 28. | Write a Python command to read data from a sensor connected to GPIO pin 18 on a Raspberry Pi. | *2* | *K2* | *CO4* |
| 29. | Discuss how ultrasonic sensors can be utilized in distance measurement applications, analyzing their advantages and limitations in various environments. | *2* | *K2* | *CO5* |
| 30. | How would you use IoT to improve traffic monitoring in a smart city? | *2* | *K3* | *CO6* |

## PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

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| 31. | a) | Explain the concept of IoT and describe how it works in enabling communication between devices. Provide examples of real-world applications of IoT. | *10* | *K2* | *CO1* |
| | | **OR** | | | |
| | b) | The Zigbee radio communication is designed for enabling wireless personal area networks. Analyze Zigbee protocol with OSI stack. | *10* | *K2* | *CO1* |
| 32. | a) | Apply the ETSI IoT architecture model to develop a machine-to-machine (M2M) communication system for an industrial automation environment. Explain how this model supports scalability, security, and efficient communication between devices. | *10* | *K3* | *CO2* |
| | | **OR** | | | |
| | b) | Apply the IoT communication model to design a low-latency communication system for autonomous vehicles. Explain the interaction between different communication protocols and layers, focusing on how the system ensures fast and reliable data exchange between vehicles and infrastructure. | *10* | *K3* | *CO2* |
| 33. | a) | Compare and contrast the communication models of TCP, UDP, and MQTT protocols in IoT systems. Illustrate how each protocol would be applied in different IoT use cases, such as smart home automation and industrial monitoring. | *10* | *K3* | *CO3* |
| | | **OR** | | | |
| | b) | 6LoWPAN allows low power and constrained devices/nodes to connect to the Internet. Explain about 6LoWPAN stack. | *10* | *K2* | *CO3* |
| 34. | a) | Explain in detail the differences between the Serial, SPI, and I2C communication protocols. Discuss their applications in IoT and analyze scenarios where each protocol would be most appropriate. | *10* | *K3* | *CO4* |
| | | **OR** | | | |
| | b) | Write the python code for the following:<br>(i) Connect LED to Raspberry Pi board that blinks every 2 seconds.<br>(ii) Connect PiCamera with Raspberry Pi and capture Images. | *10* | *K3* | *CO4* |

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| 35. | a) | Analyze the differences in the application and performance of analog and digital sensors in an IoT ecosystem. Provide examples of use cases for each type and evaluate the implications of selecting one over the other in specific applications. | *10* | *K4* | *CO5* |
| | | **OR** | | | |
| | b) | Analyze the advantages and disadvantages of using Bluetooth sensors compared to USB sensors in IoT applications. Discuss their performance in terms of data transfer rates, power consumption, range, and reliability. | *10* | *K4* | *CO5* |
| 36. | a) | Analyze the impact of IoT on energy efficiency, security, and user convenience in smart homes. Discuss the potential benefits and challenges associated with the integration of IoT technologies like smart lighting, security systems, and voice assistants. | *10* | *K4* | *CO6* |
| | | **OR** | | | |
| | b) | Explore the role of IoT in air quality monitoring systems. Evaluate the effectiveness of various sensors used (e.g., CO2, PM2.5) and the data communication methods for real-time analysis. | *10* | *K4* | *CO6* |