SASTRA

School of Mechanical Engineering
First CIA Test – SEP 2024
Course Code: EIE 228
Course Name: IoT for Industrial Automation
Duration: 90 minutes Max Marks: 50

PART A

(Answer all the questions) 10 x 2 = 20 Marks

1. Define the Internet of Things (IoT). How does it contrast with Industrial IoT (I-IoT)?
2. Identify a Cyber-Physical System (CPS) relevant to any industrial applications.
3. List two key factors that facilitate the development of IoT technologies.
4. Explain two primary use cases of Industrial IoT (I-IoT) in the manufacturing sector.
5. Define the term 'Computer-Integrated Manufacturing (CIM) Pyramid' and categorize its main levels.
6. Describe the different types of automation used in industrial processes.
7. Identify and summarize the IoT levels typically considered in an IoT deployment.
8. Differentiate between physical and logical design in the context of Industrial IoT.
9. List the various communication models used in the IoT devices.
10. Outline the key steps in the I-IoT design methodology.

PART B

(Answer all the questions) 2 x 15 = 30 Marks

1. Trace the evolution of industrial revolutions from Industry 1.0 to Industry 4.0. Discuss the key technological advancements and characteristics of each era. Additionally, compare and contrast Industry 3.0 and Industry 4.0 in terms of their technological focus, connectivity, and impact on manufacturing processes.
2. Analyze the Computer-Integrated Manufacturing (CIM) Pyramid in detail. Describe each level of the CIM Pyramid and its role in integrating various aspects of manufacturing operations. Explain how the IoT and I-IoT technologies fit into this pyramid and contribute to the overall efficiency and flexibility of manufacturing processes.
3. Explain the various levels of IoT deployment within an IoT architecture and discuss their significance. Identify and explain the specific IoT levels involved in the design of home automation systems including smart lighting and intrusion detection and illustrate how each level is implemented.

*******End *******

SASTRA
DEEMED TO BE UNIVERSITY

School of Mechanical Engineering
Second CIA Test – OCT 2024
Course Code: EIE 228
Course Name: IoT for Industrial Automation
Duration: 90 minutes Max Marks: 50

PART A

(Answer any two questions) 2 x 15= 30 Marks

1. Explain the flexible message format and the three quality of service (QoS) levels offered by MQTT protocol by which robust communication is achieved.
2. Describe the different types of IoT enablement platforms (application, data analytics, and virtualization). Analyze the emergence of Edge and Fog computing and explain how these architectures complement Cloud-based IoT environments in industrial automation.
3. Explain the role of Machine-to-Machine (M2M) communication and evaluate how 5G technology supports I-IoT in industrial automation. Analyze the impact of Software-Defined Networks (SDN) and Network Function Virtualization (NFV) on industrial automation networks.

PART B

(Answer all the questions) 1x 20 = 20 Marks

1. You are tasked with designing an IoT-based solution for a smart building management system aimed at enhancing occupant comfort, energy efficiency, and safety through real-time monitoring, automated control, and predictive maintenance. The system should integrate various IoT layers and technologies to optimize building operations and improve user experience.
   a. Design a comprehensive IoT architecture for the smart building management system, explaining how different deployment levels (sensors, gateways, cloud, and edge computing) collaborate to support real-time monitoring, automation, and control of building systems such as lighting, HVAC, and security.
   b. Outline the prototyping process and discuss the suitable communication protocol employed for transmitting data between IoT devices, sensors, and the cloud.
   c. Discuss how advanced technologies like 5G, edge computing, and Cyber-Physical Systems can be integrated into the solution to enhance building efficiency, occupant comfort, and operational sustainability.

*******End *******

SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations

Nov 2024

Course Code: **EIE228M**

Course: **IOT FOR INDUSTRIAL AUTOMATION**

QP No. **:U011-M**

Duration: **3** hours

Max. Marks:**100**

PART – A

Answer all the questions **10x2=20 Marks**

1. Identify the key enabling factors of IoT.
2. Compare IoT with Industrial IoT (I-IoT).
3. How does the integration of Cyber-Physical Systems (CPS) in the Industrial Internet of Things (IIoT) align with the layers of the Automation Pyramid?
4. Outline the steps involved in the physical and logical design of an I-IoT system.
5. Describe the role of MQTT protocol in I-IoT communication.
6. Distinguish between Fieldbus and Modbus industrial automation protocols.
7. Explain the purpose of data virtualization in I-IoT platforms.
8. Differentiate Edge Data Analytics and Cloud Data Analytics in an industrial setting.

9. Summarize how 5G technologies enhance IoT in industrial automation.

10. Describe a real-world case study of autonomous robots in industrial automation.

PART – B

Answer any FOUR questions **4x15=60 Marks**

11. Explain the structure and levels of the Computer-Integrated Manufacturing (CIM) pyramid. Discuss how each level of the CIM Pyramid contributes to the overall efficiency and integration of manufacturing processes. Compare the role of the CIM Pyramid in traditional manufacturing environments with its relevance to modern Industrial IoT (I-IoT) systems. (8+7)

12. Identify and explain the specific IoT levels involved in the design of a smart agriculture system, including soil moisture monitoring and crop health management, and illustrate how each level is implemented to enhance the efficiency and productivity of agricultural practices.

(7+8)

13. Analyze the I-IoT design methodology and describe how various communication models and APIs are employed in industrial environments. Evaluate the role of industrial protocols and automation networks in enhancing the efficiency of I-IoT solutions.

(8+7)

14. Describe the different types of IoT enablement platforms (application, data analytics, and virtualization). Investigate the emergence ofEdge and Fog computing and explain how these architectures complement Cloud-based IoT environments in industrial automation.

(8+7)

15. Explain the role of Machine-to-Machine (M2M) communication and discuss how 5G technology supports I-IoT in industrial automation. Evaluate the impact of Software-Defined Networks (SDN) and Network Function Virtualization (NFV) on industrial automation networks. (8+7)

16. Discuss a detailed case study on the implementation of autonomous robots in industrial automation. Evaluate the technologies involved, such as 5G, M2M communication, and edge computing, and evaluate the benefits as well as the challenges of these technologies within an industrial setting. (7+8)

PART – C

Answer the following **1x20=20 Marks**

17. You are tasked with designing an IoT-based solution for a smart healthcare system aimed at improving patient care through real-time monitoring, remote diagnostics, and efficient health data management. The system should integrate various IoT levels and technologies to enhance healthcare delivery and patient outcomes.
    a. Develop a detailed IoT architecture for this smart healthcare system, describing how various levels of deployment (sensors, gateways, cloud, and edge computing) work together to support real-time patient monitoring and diagnostics. (10)
    b. Outline the prototyping process and discuss the appropriate communication protocol used for data transmission between devices and the cloud. (5)
    c. Discuss how technologies such as 5G, edge computing, and Cyber-Physical Systems are integrated into the system to improve healthcare delivery and patient outcomes. (5)

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